[COMMITTEE PRINT]

PROSPECTS FOR SUSTAINABLE DEVELOPMENT IN SUB-SAHARAN AFRICA

REPORT

PREPARED BY THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT

TRANSMITTED TO THE

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**Resigned February 19, 1987 (H. Res. 89).
***Elected March 30, 1987 (H. Res. 133).

LETTER OF SUBMITTAL

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC, October 16, 1986.

Hon. THOMAS P. O'NEILL, Jr.,
The Speaker, U.S. House of Representatives,
Washington, DC.

DEAR MR. SPEAKER: By direction of the Committee on Science and Technology, I submit herewith the report titled, "Prospects for Sustainable Development in Sub-Saharan Africa", to the 99th Congress. This report is based on a series of hearings held in September and October, 1985, by the Subcommittee on Natural Resources, Agriculture Research and Environment.

Sincerely,

DON FUQUA, *Chairman.*

LETTER OF TRANSMITTAL

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC, October 15, 1986.

Hon. DON FUQUA,
Chairman, Committee on Science and Technology, House of Representatives, Washington, DC.

DEAR MR. CHAIRMAN: Enclosed is the final version of the report, "Prospects for Sustainable Development in Sub-Saharan Africa."

In September and October of 1985, the Subcommittee on Natural Resources, Agriculture Research and Environment held five days of hearings on hunger in sub-Saharan Africa, and prospects for sustainable, long-term development. Over these five days, the Subcommittee learned a great deal about the complex set of interrelationships between land, population, environment, climate, food and famine in sub-Saharan Africa.

The Subcommittee staff prepared a draft report analyzing those hearings and containing recommendations for action based on what we heard. The report builds on an excellent summary of the hearings which was prepared by the Congressional Research Service at our request, and which is attached to the report.

On October 9, 1986, a quorum being present, the Subcommittee on Natural Resources, Agriculture Research and Environment met and, having considered the report, approved forwarding the report to the full Committee for further consideration with a recommendation that it be issued as a Committee report.

The report addresses the subjects covered by the hearing: (1) the causes and predictability of drought; (2) the deterioration of Africa's natural resource base; (3) the prospects for sustainable agricultural development; (4) the ramifications of Africa's unparalleled population growth; and (5) the importance of women to African development.

The discussion and recommendations in the report reflect the consensus of the witnesses that despite the vast problems facing sub-Saharan Africa, there appears to be promise for reversing Africa's decline and restoring Africa's food self-sufficiency.

Mr. Chairman, the report does not purport to be the exhaustive analysis of all of Africa's problems. As we all know, the natural disasters in Africa are all too frequently compounded by war, political turmoil, unsound government policies and economic distress. Plainly, significant reforms in these areas are a necessary precursor of long-term development.

But the Subcommittee hopes that the report will help to focus increased attention on the equally important relationships between food and population, between development and degradation of natural resources, and between greater productivity and the role of

women. Greater understanding of these factors can help to ensure that the development aid we give to Africa is appropriately designed to increase Africa's potential to feed its own people. We hope that the report, along with the recommendations contained in it, will help to contribute solutions to Africa's long-term problems.

I would like to commend the Subcommittee staff for its work in preparing this report and to recognize Perdita Huston for her assistance and contributions.

We request that the report be presented to the full Committee for consideration at the earliest convenient time.

Sincerely,

JAMES H. SCHEUER,
Chairman, Subcommittee on Natural Resources, Agriculture Research and Environment.

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I. Overview

AN INTEGRATED NATURAL RESOURCES PERSPECTIVE

Few events have galvanized the world's attention like the African drought and famine of 1983–86. Its dimensions were truly staggering. According to the United Nation's Food and Agriculture Organization, as many as 1 million people may have perished due to starvation or illnesses compounded by inadequate nutrition. Another 150 million Africans left their homes in search of food; nearly 3 million among them remain refugees. Had the United States and other nations not provided massive amounts of emergency aid, the consequences of drought and famine would have been far worse.

Today, in most regions affected by the drought, rainfall has resumed, food crops are growing; famine is no longer an imminent danger. The recent crisis is past, but a large portion of Africa's people remain vulnerable: malnourished, illiterate, unskilled, and unprepared to withstand the vagaries of nature. Unless action is taken now to address the underlying causes of famine, future droughts will trigger other famines again and again.

To prevent future famine, the root causes of the recent crisis in Africa must be understood. Conventional analyses attribute the failure of the African food crop and the consequent famine to the combination of drought, political turmoil and ill-advised agricultural policies that discourage surplus production.[1] This perspective

[1] It has been well established that the agricultural policies adopted in the past by several African nations have adversely affected agricultural production. In particular, state policies of

Continued

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implies that the resumption of normal rainfall and the adoption of market-oriented economic policies will enable Africa to feed itself once again.

While these factors are certainly significant, there are others that must be considered. The causes of the famine must be studied from an integrated persepctive which considers the impact of Africa's rapid population growth on its infrastructure and its fragile ecological base. Pressured by the need to feed fast-growing populations and relying on the advice of developed nations, Africans abandoned traditional agricultural practices which were well-adapted to the fragile, arid ecosystems of sub-Sahran Africa. Lacking adequate skills for proper natural resource management, Africans overused marginal farmland, and used inappropriate western agricultural techniques, leading to soil erosion, loss of soil fertility, and widespread desertification. Deforestation, caused by steadily increasing demands for fuelwood for heating and cooking, joined with these practices to overtax the regenerative capacity of the ecosystem, leaving the farmlands of Africa totally vulnerable to the severe drought of 1983–1984.

Viewed from this perspective, the famine can also be seen as the result of the collapse of a severely-stressed ecosystem, not simply that of transitory meteorological and political events. This view suggests that par capita food production will continue to decline in sub-Saharan African, with even harsher consequences when future droughts occur, unless a long-term commitment is made to rehabilitate the environment, curtail unparalleled population growth,

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keeping prices of food artificially low to prevent protests by urban populations pushed farmers out of production as farming became unprofitable. For a general discussion of this issue, see, e.g., "Accelerated Development in Sub-Saharan Africa: An Agenda for Action," World Bank, 1981. As several witnesses noted, adoption of market-oriented economic policies which reward farmers with profits is a necessary part of any effort to restore Africa's capacity to feed its people. Hearing Record at 350–1, 357 (Lloyd Timberlake); 592, 601 (Lester Brown); 607–608 (Mark Edelman; 797 (Loret Miller Ruppe); CRS Summary at 42. See also remarks of Cong. Paul Henry, Hearing Record, 320. Lloyd Timerlake cited the example of Zimbabwe, where adoption of market-oriented policies has contributed to surplus grain crops. Hearing Record at 592.

Similarly, witnesses noted that any effort to increase food production, including those which would be appropriate and environmentally sound, would be destined to failure without appropriate underlying government policies. As one witness bluntly stated, "[T]here are situations in which no technology and no aid are really going to work because conditions, political conditions often are so set against its working." Hearing Record at 357 (Timberlake). See also Hearing Record at 797 (Ruppe); remarks of Chairman James H. Scheuer at 797. Witnesses also noted other factors responsible for disruption of the food supply: war, inadequate infrastructure, use of food supplies as a political and military weapon, government corruption and mismanagement. See, e.g., comments of Lester Brown (Hearing Record at 601); "Science and Technology for a Sustainable African Agriculture," Charles Weiss, Hearing Record at 888. As Lloyd Timberlake stated, "If environmental degradation is a symptom of mismanagement, then projects and technology to resuscitate that environment *will not work* unless that mismanagement is converted into effective management." Hearing Record at 352 (emphasis in original).

While such issues must clearly be addressed in any long-term relief program, the hearings were not intended to discuss such policy issues, which have been treated at length elsewhere. Nor did the hearings address the implementation of the emergency famine food aid program. Rather, the hearings focused on the question of identifying agricultural technologies which could provide the best chance for developing a long-term capability to increase food production from a fragile environment. For even with the best of government policies, the technical challenges of ensuring sufficient and reliable food supplies for Africa's growing population are enormous. Witnesses acknowledged that the agricultural success achieved in this country and the success of the Green Revolution in Asia and Latin America are simply not transferable to Africa. See, e.g., Hearing Record at 437 (Nyle Brady). Some indication of the technological difficulty in growing food in such environments is provided by the experience of Australia, which has only been able to boost its grain yield per acre 18 percent over the last 30 years, while Africa has increased the yield 38 percent. (By comparison, North America has improved yields 128 percent.) Reversing Africa's Decline, Brown and Wolf, at 56–57.

and utilize limited natural resources in a rational, sustainable manner.

Development of a sustainable agricultural system must be coupled with a reduction in the rate of population growth to levels which can be supported by natural resources. In both cases the role of women is critical. African women currently do 60–80 percent of the work involved in growing, processing, and marketing food, yet few programs focus on improving the farming skills and economic potential of women. Increased training of women farmers can lead to improved food production and increased economic status for women. In addition, as experience in many developing countries suggests, increased economic status for women results in lower birth rates.

In sum, prospects for improving sub-Saharan Africa's food security rest in part upon the adoption of long-term development strategies which will restore damaged natural resources, promote sustainable agricultural practices, improve natural resource management, and slow population growth. As a pre-condition to these strategies, broad-gauged policies must bring Africa's greatest untapped natural resource, its 225 million women, into mainstream development efforts.

II. Hearings

A. BACKGROUND

The Subcommittee on Natural Resources, Agriculture Research and Environment held five days of hearings in the fall of 1985 to examine the prospects for sustainable development of sub-Saharan Africa. The first hearing, on September 19, assessed the impact of the recent drought on the environment and human populations and discussed the possibility of long-term climate change in the sub-Saharan region. Witnesses presented an historical record of drought in the region, discussed changes in global weather patterns which may affect drought occurrence, and described the research and monitoring tasks necessary to provide early warning of future droughts.

The second hearing, held on October 17, assessed the impact of present and future populations on the development of the continent. The first panel of witnesses examined the political and demographic consequences of rapid population growth. The second panel focused on factors which promote high fertility in the region and on the requirements for successful family planning programs.

Hearing on October 23 and 30 addressed the related topics of environmental degradation, appropriate technology and sustainable agricultural techniques. In each of the hearings, the crucial need to involve women in all development efforts was a common theme. Witnesses described useful technical innovations such as water harvesting methods, biotechnology, and development of salt-tolerant crops.

On October 31, the Subcommittee heard testimony on various long-term solutions to environmental degradation and declining per-capita food production.

The full record of the hearings is published in Committee Print 99– , "Africa and Hunger: Prospects for Sustainable Development in Sub-Saharan Africa" (hereinafter cited as Hearing Record).

At the Subcommittee's request, the Congressional Research Service prepared a summary of the extensive hearings for the Committee's use, "Issues Related to Hunger in Africa: Drought, Population Growth, Environment and Resources, and Agricultural Development" (hereinafter referred to as CRS Hearing Summary). The CRS Hearing Summary is attached to the Committee Report as an Appendix.

B. CLIMATE, ENVIRONMENT AND NATURAL RESOURCES

1. Climate, Soils and Forests

The climate and soils of much of Africa render the continent particularly vulnerable to drought.[2] Much of Africa is arid or semi-arid. Rainfall varies considerably in quantity, timing, and location, and according to Dr. Sharon Nicholson, "three quarters of the African continent is * * * inherently prone to drought." [3] Rain—if it comes at all—falls heavily within a short period of time. To support agriculture, it must fall at the appropriate time, at regular intervals, and the soil must retain enough water for the long dry season.[4]

Then, too, Africa's soils are extremely vulnerable to the consequences of drought.[5] They are generally poor in nutrients, highly erodable, and when stripped of vegetation and exposed to rain and sun, bake into an impermeable substance nearly as hard as concrete.[6] This results in rapid runoff of rainwater which, in turn, reduces groundwater storage.[7] The twin processes of erosion and gullying carry away topsoil and further lower the water table. Precious rainwater is lost in this process, reducing the soil moisture needed for subsequent plant growth. With care these fragile soils could absorb and store rainwater; currently, however, they are extremely vulnerable to drought.

As Lester Brown points out, the process of ecological decline "seems to begin with an excessive loss of tree cover," [8] because tree cover is a critical component of soil protection. Leaf cover lessens the impact of heavy rains, and root systems protect soil from eroding, keep moisture in the soil, and recycle nutrients to the soil's top layers.[9]

As in many other parts of the developing world, trees in extended areas of sub-Saharan Africa are harvested far faster than they are replaced.[10] Trees are felled to create pasture or cropland, cut for fuel and firewood, or harvested for export markets. This widespread deforestation contributes significantly to the process of

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[2] CRS Hearing Summary at 28–30.
[3] Hearing Record at 9 (Nicholson, Dr. Sharon E.).
[4] Brown, L.R. and Wolf, E.C., "Reversing Africa's Decline", Worldwatch Paper #65, 1985, at 40; Wijkman, A. and Timberlake, L., "Natural Disasters: Acts of God or Acts of Man?", at 35–36.
[5] CRS Hearing Summary at 30–31.
[6] Wijkman and Timberlake, Ibid. at 36.
[7] Hearing Record at 373 (Irwin-Williams, Dr. Cynthia); Brown and Wolf, Ibid., at 39.
[8] Hearing Record at 590 (Brown, Lester R.).
[9] Brown and Wolf, Ibid., at 43.
[10] Hearing Record at 402 (Kramer, John Michael); Brown and Wolf, Ibid., at 12–15.

desertification which now threatens African lands in an area four times the size of India.[11]

2. The Drought of 1983–1984

While recurrent drought is an inherent part of the region's natural environment, the drought of 1983–84 was particularly severe.[12] It caused crop failures over a region of sub-Saharan Africa twice the size of the U.S.,[13] depriving millions of Africans of sufficient food supplies, many to the extreme point of starvation.

Several hypotheses have been advanced to explain the drought.[14] As noted above, drought is a normal, repetitive occurrence in arid and semi-arid regions. Thus, many experts feel that the 1983–84 drought was a manifestation of normal meteorological variability.

However, evidence that African droughts have become more frequent and more persistent has led other experts to hypothesize that the climate of the African Sahel [15] is changing. From geological records scientists know that during the past 10,000 years, the region has undergone several shifts in climate, experiencing both relatively wet and dry periods.[16] The current dry trend could therefore presage another cyclical, albeit catastrophic, shift in the region's climate.[17]

Other experts contend, however, that man-induced changes in the physical and biological environment of the region have caused or exacerbated the recent drastic reduction in rainfall. This hypothesis suggests that deforestation and desertification can fundamentally alter the hydrologic cycle and produce dryer climate,[18] which in turn accelerates the process of desertification.

At the Subcommittee hearing, experts testified that there is little evidence that local land-use changes cause climate disruption. As Dr. Jagadish Shukla testified, however, these anthropomorphic changes "might be amplifying an already existing effect due to global factors." [19] Whatever the cause, however, each hypothesis suggests that Africa will face more droughts in the future.

3. Drought Prediction Capability and Famine Monitoring

If scientists could successfully forecast oncoming drought, the crises of famine could be lessened.[20] Currently, two factors constrain scientists' ability to predict drought in Africa: [21] (1) effective long-term weather forecasting is limited by the scarcity and poor quality of meteorological data from Africa; [22] and (2) models of

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[11] Hearing Record at 245 (Speth, James Gustave).
[12] CRS Hearing Summary at 2–3.
[13] Hearing Record at 6 (Nicholson).
[14] CRS Hearing Summary at 3–4.
[15] The African Sahel is the arid region which lies between the Sahara desert and the coastal rain forests. It encompasses the nations of Senegal, Mauritania, Burkina Faso, Mali, Niger, Chad, Sudan and the northern zones of Cameroon.
[16] Brown and Wolf, Ibid., at 21.
[17] Brown and Wolf, Ibid., at 21.
[18] Hearing Record at 124 (Shukla, Dr. Jagadish); at 10 (Nicholson); Brown and Wolf, Ibid., at 26–29.
[19] Hearing Record at 117 (Shukla).
[20] CRS Hearing Summary at 6–7.
[21] CRS Hearing Summary at 4–5.
[22] Hearing Record at 7 (Nicholson); at 20 (Rasmusson, Dr. Eugene M.).

global atmospheric circulation patterns and weather systems specific to Africa are inadequate.[23] Nonetheless, witnesses reported that with a modicum of research, scientists could imporve long-term weather forecasting.[24] They also pointed out that better understanding of global weather phenomena would enhance U.S. weather predictive capability and be of significant benefit to U.S. agriculture.[25]

With an additional capability to assess the degree and location of food scarcity, aid could be mobilized far in advance of the onset of famine, and food could be distributed to affected regions before people begin to sell their oxen, before people begin to eat their seed stock, before people abandon their property to search for food, and before people begin to starve.[26] Unfortunately, lack of a systematic, long-term program to anticipate, monitor, and locate areas of food scarcity hampered the ability of relief agencies to ameliorate the consequences of the recent drought.[27]

Scientists presently have the ability to locate potential famine areas up to two months before harvest by using a combination of remote sensing data and ground observations.[28] Pilot programs, such as the Agency for International Development's (AID) Famine Early Warning System (FEWS) and the Department of Agriculture's report, World Food Needs and Availabilities, which were developed with the cooperation of the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA), have shown great promise in predicting areas of food scarcity.[29] However, such programs have been hampered by insecure funding and budget reductions. In addition, they are somewhat duplicative and could benefit from better interagency coordination.[30]

C. POPULATION GROWTH AND FAMILY PLANNING PROGRAMS

1. Population Growth Rates

The present population growth rate in Africa is the highest in the world.[31] Averaging about 3 percent per year,[32] population growth rates soar to over 4 percent in some countries, notably Kenya.[33] Each year, Africa must provide for another 16 million people. The high population growth rate is due primarily to improved health care which has led to decreases in child and maternal mortality and increases in longevity.[34]

In contrast to the experience in other parts of the developing world, however, the introduction of modern health care into Africa has not been followed with a decline in fertility, or even a decline

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[23] Hearing Record at 117 (Shukla).
[24] Hearing Record at 7 (Nicholson); at 123 (Shukla).
[25] Hearing Record at 29 (Rasmusson).
[26] Hearing Record at 32 (Hock, Dr. Joan C.); at 848–876, CRS Report, "Monitoring and Forecasting Drought and Famine" (hereinafter referred to as CRS Monitoring Report).
[27] Hearing Record at 849 (CRS Monitoring Report).
[28] Hearing Record at 32 (Hock).
[29] Hearing Record at 33 (Hock).
[30] Hearing Record at 927 (Hock); at 871–875, (CRS Monitoring Report).
[31] Hearing Record at 143 (Teitelbaum, Dr. Michael S.).
[32] Hearing Record at 165 (Isaacs, Stephen).
[33] World Resources 1986, World Resources Institute and International Institute for Environment and Development, 1986, at 236.
[34] Hearing Record at 147 (Teitelbaum).

in desired family size.[35] For many reasons (detailed in the CRS Summary at 15–18), the desired family size in Africa remains the highest in the world—7.5 children. Indeed, Africa is the only region in the world where average fertility—6.7 children—is lower than desired family size.[36]

Africa's population growth will not decline in the near future. Indeed, the demographics of the African population contain alarming implications for future population growth. At present nearly half of Africa's 500 million people are under 15 years old.[37] In the two decades ahead, the children of today will become parents. As a result, even if fertility were to drop immediately to a "replacement" level of approximately two births per woman, virtually all the nations of sub-Saharan Africa would still double their populations by 2010, or soon thereafter.[38] The key question is not whether the population will double in the next several decades, which is a virtual certainty. Rather the question is whether that level will itself double in the two to three decades following 2010.[39]

2. Population, Food and Resources

The implications of this rapid population growth for stable development are grim. As recently stated in a World Bank report, "On the basis of current experience, the existing rate of population growth in Africa is obviously higher than the rate at which the capacity to meet essential needs can be increased." [40]

In particular, African agriculture has not been able to feed the growing population. Indeed, at the heart of the long term food crisis in Africa lies the continued discrepancy between the continent-wide rate of population growth of 3.1 percent and the continent-wide rate of food production growth of 1 percent.[41] Africans now have 20 percent less food per capita than in 1965.[42] To meet future needs, Africa must dramatically increase its food production. Some indication of the enormity of this task is suggested by the fact that Nigeria, currently the most populous country in Africa with a population of 108 million, may have as many as 500 million people by the year 2050—making it the third largest country in the world exceeded only by China and India.[43] A recent World Bank report noted,

> Just to sustain the inadequate current standards for nutrition, agricultural production in Africa would have to grow at a sustained rate of over 3 percent per year over the next 20 years. Only a few countries, all outside Africa,

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[35] Hearing Record at 146–147 (Teitelbaum).
[36] Faruqee, R. and Gulhati, R., "Rapid Population Growth in Sub-Saharan Africa: Issues and Policies", World Bank Staff Working Paper #559, 1983, at 46.
[37] Hearing Record at 144, 149 (Teitelbaum).
[38] Hearing Record at 149–150 (Teitelbaum).
[39] CRS Hearing Summary at 12–13.
[40] Financing Adjustment With Growth in Sub-Saharan Africa, 1986–1990, The World Bank, 1986, at 25.
[41] Hearing Record at 647–648 (Edelman, Mark).
[42] Hearing Record at 901–917 (Report by the Group of Experts on Aid to Africa Appointed by the Bonn Economic Summit, submitted by Edelman).
[43] Hearing Record at 155 (Teitelbaum).

have achieved growth rates in agriculture above 3 percent a year for sustained periods.[44]

While Africa is not densely populated, particularly in comparison to developing nations in Asia,[45] the capacity of the land to support expanded agricultural production to feed rapidly increasing populations is relatively poor and varies significantly from country to country.[46] As Dr. Michael Teitelbaum stated at the hearings,

> There are some very favorably endowed countries in sub-Saharan Africa that are very sparsely populated and have tremendous potential for supporting larger populations. There are others that are exceeding their capacity to support their populations already.[47]

In many areas, the effort to provide food and fuel for new Africans will severely strain an already-overburdened natural resource base.[48] To increase food production, rural Africans will attempt to farm increasingly-marginal lands and increase herd sizes, leading to erosion and desertification. Growing demands for housing and fuel will lead to increased deforestation.[49]

In addition to posing major problems for agriculture, the rapid population growth will also stretch Africa's already meager financial resources for education facilities, health services, housing, and employment.[50] Furthermore, inadequate services will take a particularly heavy toll on children.[51]

Such stresses have also caused rapid growth in Africa's urban centers.[52] Rural populations, unable to feed themselves, migrate to cities in search of jobs.[53] Twenty years ago, only three African cities counted more than a million people. Today there are 28. Many observers have noted that Africa's urban populations, often existing in poverty, are the source of political instability and the political demand for low food prices which have hindered the development of sound agricultural and natural resource policies.[54] Noting the self-reinforcing aspects of these trends, Dr. Teitelbaum noted at the hearing that:

> [I]t is the urban population that is the source of political instability, . . . the source of political threat, and it is for this reason that many countries in this region have kept down prices for food paid to the farmers of these countries. The result has been impoverishment for the farming popu-

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[44] Population Growth and Policies in Sub-Saharan Africa, A World Bank Policy Study, 1986, at 3 (hereinafter cited as World Bank Population Report).
[45] Hearing Record at 148 (Teitelbaum).
[46] Hearing Record at 148–149 (Teitelbaum). Teitelbaum cited the FAO Report entitled "Land Resources for the Future", which found that of the 40 sub-Saharan countries, fourteen, representing half of the sub-Saharan African population, could not support their 1975 populations.
[47] Hearing Record at 143 (Teitelbaum).
[48] CRS Hearing Summary at 13; Hearing Record at 244 (Speth); Milas, S., "Desert Spread and Population Boom", Desertification Control Bulletin, United Nations Environment Programme, Number 11, December 1984.
[49] Hearing Record at 664 (Sinding, Steven).
[50] CRS Hearing Summary at 13–14; Hearing Record at 663–664 (Sinding).
[51] CRS Hearing Summary at 14; Ahmed, M., Within Human Reach: A Future for Africa's Children, UNICEF, 1985, at 14–16.
[52] CRS Hearing Summary at 12.
[53] Hearing Record at 151–152 (Green, The Hon. Marshall).
[54] Hearing Record at 153 (Green) ("Continuous changes in government make it most difficult, if not impossible, to have a sustained program in population or in many other fields as well.").

lations, a reduction if anything in food production, and certainly incapacity to raise per capita food production and a tendency to accelerate rural-to-urban migration.[55]

3. Family Planning Programs in Sub-Saharan Africa

The experience of other developing societies suggests that as development occurs, birth rates eventually decline as the perceived economic and social value of large families declines and birth control practices become acceptable and available.[56]

As noted above, desired family size and fertility in Africa remain high, even in comparison to other developing regions of the world.[57] The desire for large families is rooted in strong cultural, economic, and religous beliefs.[58] Nevertheless, there are indications that changes in such attitudes are beginning to take place.[59]

African leaders, who have in the past dismissed concerns about population growth, have increasingly become aware of the adverse impacts of high population growth rates on economic development and have accordingly adopted population policies.[60] According to a recent World Bank study, "Population Growth and Policies in Sub-Saharan Africa," about three-quarters of African countries now endorse family planning, at least for health reasons.[61] In contrast, in 1974, only two African nations had population policies. This attitudinal shift on the part of African leaders is a necessary precursor to the success of family planning programs which depend largely on the support, both political and economic, of host governments.[62]

There is also a growing popular demand for family planning services.[63] According to a recent World Fertility Survey, 4 to 16 percent of those African women surveyed wanted no more children and 23 to 60 percent wanted to delay having a child.[64] In Zimbabwe, where contraceptives have been readily available, use of modern birth control has increased dramatically in the last 5 years.[65] The World Bank recently concluded in a report that "Although demand for family planning in Africa is limited compared with that in other regions, it is far more extensive than was thought until recently."[66]

For a variety of reasons, however, the need for family planning is not being met by current family planning programs in Africa.[67] Only about 10 percent of couples are using contraceptives. One major survey of family planning programs in Africa classified all of the programs as either "weak" or "very weak".[68] One of the major

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[55] Hearing Record at 144 (Teitelbaum).
[56] Hearing Record at 143, 147-48 (Teitelbaum).
[57] World Bank Population Report, Ibid. at 35-36.
[58] World Bank Population Report, Ibid. at 11-13.
[59] Hearing Record at 674 (Sinding).
[60] CRS Hearing Summary at 19-20; Hearing Record at 159, 170 (Isaacs); 186-187 (Fornos, Werner).
[61] World Bank Population Report, Ibid. at 1.
[62] CRS Hearing Summary at 18-19.
[63] Hearing Record at 200 (Speidel, Dr. J. Joseph).
[64] Hearing Record at 195 (Speidel).
[65] Brown and Wolf, Ibid., at 34; World Bank Population Report, Ibid. at 5.
[66] World Bank Population Report, Ibid. at 43.
[67] CRS Hearing Summary at 16-17, 19-20.
[68] Hearing Record at 174 (Isaacs).

constraints appears to be the provision of family planning services solely through existing health facilities, which are particularly scarce in the rural regions.[69] As Mrs. Ofosu-Amaah, a former Ghanaian economic planning official, stated in her testimony,

> Since these [health] services reach only between 25 to 30 percent of Africa's populations (i.e., mainly in the urban areas), accessibility, proximity, frequency of services and the ready availability of supplies leaves much to be desired.[70]

A recent World Bank Report concluded that, "Except in a few countries, the potential demand for family planning has hardly been tapped." [71]

Internally-funded expansion of government health and family planning services, however, is difficult in light of the serious economic woes of most African nations. Assistance from multilateral aid agencies, available for many developmental needs, is rarely given for family planning programs.[72] Given the onerous debt of many African countries, both lenders and borrowers are unwilling to fund family planning programs, because, as Werner Fornos points out, "they cannot see a direct connection between that spending and the generation of income to repay the loans." [73] Furthermore, most multilateral development banks loans are made at relatively high commercial interest rates,[74] a policy which discourages both lending and borrowing for family planning programs because the benefits accrue over the long-term and to the country as a whole rather than to any one source from which repayment can be extracted.

D. NATURAL RESOURCES MANAGEMENT

1. Deforestation and Desertification

As Africa's population expands, the increasing demand for farmland, firewood, and foreign exchange accelerates the rate of deforestation. Each year, another 1.3 million hectares, an area larger than the state of Connecticut, are deforested.[75] In turn, deforestation contributes to loss of soil nutrients and devastating rates of erosion [76]—the latter estimated by AID at more than a billion tons per year for the Ethiopian highlands alone. Erosion deforestation, and loss of soil nutrients produce desert-like conditions that can be reversed only with enormous inputs of capital and labor.[77] Some 6.9 million square miles of Sub-Saharan Africa—an area more than four times the size of India—are under direct threat of desertification.[78]

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[69] Hearing Record at 664–65 (Sinding).
[70] Hearing Record at 220 (Ofosu-Amaah, Virginia). Witnesses agreed that African family planning programs were inadequate. See, e.g., Hearing Record, at 174 (Isaacs); at 195 (Speidel) at 207 (Harris, Nancy).
[71] World Bank Population Report, Ibid. at 5.
[72] Hearing Record at 940–941 (Green); at 945 (Isaacs).
[73] Hearing Record at 950 (Fornos); 958 (Ofosu-Amaah).
[74] Hearing Record at 163 (Isaacs); 958 (Ofosu-Amaah); 954 (Speidel); CRS Summary at 18, 24.
[75] Hearing Record at 245 (Speth).
[76] CRS Hearing Summary at 31–33.
[77] Stiles, D., "Desertification: A Question of Linkage", Desertification Control Bulletin, United Nations Environment Programme, Number 11, December 1984.
[78] Hearing Record at 245 (Speth).

Employing long fallow periods and nomadic livestock herding, traditional agriculture techniques "were well-adapted to the limits imposed by the fragile and arid conditions in Africa." [79] To meet the increased food demands of the rapidly expanding population, however, small farmers shortened fallow periods and attempted to farm marginal land.[80] Consequently, soil fertility declined rapidly, priming the crops for failure under an extended drought. Responding to the same pressures, cattle herders dramatically increased herd sizes, and the larger herds caused extensive environmental damage through overgrazing and soil compaction.[81]

In some instances, reliance on cash crops and inappropriate western agricultural technologies also contributed to environmental degradation. As Gus Speth pointed out, "Cash crops like cotton and peanuts consume large amounts of nutrients and reduce soil fertility." [82] Large-scale mechanized agricultural technologies are unsuitable for the shallow, poor topsoil typical of many areas of sub-Saharan Africa.[83] Wells, drilled by well-meaning aid agencies to provide water for people and cattle, exacerbated desertification as nomadic herdsmen settled around the wells and their animals overgrazed the neighboring rangeland.[84]

Recognizing the environmental degradation that often accompanied development efforts, development agencies such as AID and the World Bank are attempting to integrate environmental concerns when planning and implementing new projects. With Congressional direction, AID has been a leader in this regard.[85] However, attaining this goal has been hampered by the limited nature of agency review and the lack of internal expertise in environmental issues. According to the Environmental and Energy Study Institute Report "Helping Developing Countries Help Themselves:"

> AID often still employs an out-dated method of cost-benefit analysis that undervalues or neglects environmental problems and opportunities. And there are still relatively few AID personnel who are trained to take environmental factors into account, much less who are trained environmental professionals.[86]

2. Sustainable Agriculture Technologies

There is a direct relationship between environmental deterioration and poor agricultural methods.[87] Environmental degradation decreases food production, leading to the cultivation of more marginal lands which produces still more environmental degradation.

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[79] Hearing Record at 244 (Speth).
[80] Hearing record at 435 (Brady, Dr. Nyle C.); at 565 (Fibre-Smith, Elise).
[81] Timberlake, L., Africa in Crisis: The Causes, the Cures of Environmental Bankruptcy, 1985, at 87-95.
[82] Hearing Record at 244 (Speth).
[83] Hearing Record at 387 (Kamusikiri, James G.).
[84] O'Leary, M., "Ecological Villains or Economic Victims: The Case of the Rendille of Northern Kenya", Desertification Control Bulletin, United Nations Environment Programme, Number 11, December 1984.
[85] Hearing Record at 279 (A Congressional Agenda for Improved Resource and Environmental Management in the Third World: Helping Developing Countries Help Themselves. Environmental and Energy Study Institute, submitted by Speth.) (hereinafter referred to as the EESI Report).
[86] Hearing Record at 279 (EESI Report).
[87] CRS Hearing Summary at 25-28.

Thus, restoring Africa's ability to feed itself depends in large part on developing sustainable agricultural methods, i.e. methods that rehabiliate the environment as well as increase agricultural productivity.[88]

According to Peter Freeman,

> I am convinced that agricultural development in Africa development and environmental restoration must be one and the same. Efforts to restore the environment will fail unless they bring benefits to the farmer. In essence, agricultural development in Africa must pursue mutually dependent goals of increasing food production and restoring, or conserving agriecosystem productivity.[89]
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> Unfortunately, western style agriculture and the "Green Revolution" techniques of Asia and Latin America are not sustainable in Africa [90], because these techniques damage the environment and rarely increase yields significantly. Moreover, they often depend on irrigation, which is impractical in large areas of sub-Saharan Africa.[91] The economic constraints and inadequacies of African infrastructure also limit their use, because these methods rely heavily on widespread use of fertilizers and pesticides. Mr. Edelman of AID said:
>
> [W]e * * * have tried to take the high technology approaches of Asia and transplant them to Africa, and they haven't worked. What we need to do now * * * is maybe use some high technology to develop low input technologies.[92]

Indigenous African agriculture as well-adapted to the limitations of soil and climate, but was capable of providing adequately only for smaller populations without sacrificing soil fertility. Research could improve the yields of these indigenous techniques while retaining their ability to conserve soils, water, and forests.[93]

Witnesses also promoted several other agricultural technologies which have potential for providing sustainable yields in sub-Saharan Africa while preserving the environment: [94]

> Aquaculture—the production of animals or plants, usually in ponds built specifically for this purpose. Aquaculture has been highly successful in wetter regions of Africa, and certain species of fish or algae that tolerate brackish and salt water may be raised in arid regions as well. Extensive brackish water aquifers are common under much of the Sahel; [95]
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> Alley cropping—interplanting of several crops in the same field, each with a different maturation schedule and nutrient need; [96]

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[88] Hearing Record at 246 (Speth); at 351 (Timberlake, Lloyd); at 802 (Smuckler, Dr. Ralph).
[89] Hearing Record at 529 (Freeman, Peter).
[90] Hearing Record at 395 (Kamusikiri); at 347 (Timberlake); at 802 (Smuckler).
[91] Hearing Record at 370–372 (Irwin-Williams); at 396 (Kamusikiri).
[92] Hearing Record at 682 (Edelman).
[93] CRS Hearing Summary at 34–36; Brown and Wolf, Ibid., at 42–45.
[94] CRS Hearing Summary at 34–38, 49–51).
[95] Hearing Record, at 327–328 (Asner, Ed); at 331–332 (Winchell, Paul); 336 (Heimlich, Henry).
[96] Hearing Record at 445 (Brady).

Agroforestry—the combination of food crops with trees that provide mulch, fertilizer, fruit and, ultimately, fuel; [97]

Home gardening—small scale vegetable production for family consumption which significantly improves family nutrition; [98]

Water harvesting—a simple form of watershed management which has potential to increase water supply and decrease erosion simultaneously; [99] and

Integrated crop-livestock management—integration of farming and herding which improves the efficiency of both.[100]

Success in implementing these agricultural techniques will depend on several factors such as support at both village and national levels; the degree to which such techniques are consistent with the local social, religious, political, cultural, and economic conditions and needs; and the degree to which such practices benefit small farmers.[101] Witnesses also stressed that successful introduction of these or other technologies depends on competent extension services, noting that agricultural extension services in Africa are often weak and virtually nonexistent for women farmers, who produce the bulk of the food on the continent.[102]

3. The Role of Agricultural Research

Africa's declining per capita food production can also be partly attributed to the failure of agricultural research to develop farming systems, plants, and animals which are compatible with the African environment.[103] Agricultural research conducted in U.S. universities concentrates on the concerns of agribusiness, including large-scale, capital-intensive agricultural technologies which are inapplicable to Africa.[104] Relatively little research has focused on agricultural techniques suited to the subsistence farmer. Moreover, until recently most agricultural research in Africa focused on cash crops, instead of traditional food crops. In addition, technologies and seed stocks introduced for use in Africa were often developed on other continents, and were ill-adapted to the climate, soils, and pests of Africa.[105] Also, due to weak extension services, information transfer between research institutes and small African farmers is poor, stifling both the development and implementation of appropriate farming methods.[106]

Perhaps most important, however, is the fragile state of agricultural research institutions in sub-Saharan Africa. Few agricultural research centers, for example, have sufficient expertise in new biotechnology techniques to develop more resilient and higher yielding food crops from native genetic resources.[107] African scientists

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[97] Hearing Record 406–427 (Kramer).
[98] Hearing Record at 504–512 (Meisel, Albert).
[99] Hearing Record at 366–368 (Irwin-Williams).
[100] Africa Tomorrow: Issues in Technology, Agriculture, and U.S. Foreign Aid, OTA Technical Memorandum, December 1984, at 23.
[101] Hearing Record at 351–354 (Timberlake); OTA Technical Memorandum, Ibid., at 4–6.
[102] Hearing Record at 573 (Obbo, Dr. Christine); OTA Technical Memorandum, Ibid., at 46–49.
[103] CRS Hearing Summary at 41–42; OTA Technical Memorandum, Ibid., at 27–32.
[104] Ibid., OTA Technical Memorandum, at 31.
[105] Hearing Record, at 890 (Science and Technology for a Sustainable African Agriculture, submitted by Weiss, Charles).
[106] Ibid., OTA Technical Memorandum, at 50–56.
[107] Hearing Record at 434 (Brady).

have limited access to training, research money or modern facilities,[108] and poor pay and low esteem reduce morale and productivity of the scientific community.[109]

AID has proposed a long range (20–30 year) plan to improve Africa's capability for agricultural research.[110] The AID plan would develop a small number of agricultural research centers at African universities. These centers would focus on food staples and concentrate on techniques applicable to subsistence farmers. Exchange between farmer and scientist would be encouraged, and the subsistence farmers, men and women, would actually perform much of the research on their own plots.

The AID plan also intends to train agricultural scientists in Africa. Initially, African scientists would be trained in the U.S., but the technical level personnel would be trained at the fledgling agricultural centers. As the scientific expertise of the centers increases, training of agricultural scientists could also be done within the centers.

Underscoring the importance of strengthening the research capacity of African institutions, Dr. Smuckler stated:

> Such an approach would include attention to agricultural scientific and technological manpower needs, strengthening institutions to train advanced manpower in these fields, and concerted attention to strengthening agricultural research through building up R&D capacity.[111]

E. THE ROLE OF WOMEN IN DEVELOPMENT

Women in African societies work long hours at difficult and tiring tasks.[112] They produce, process, and market food crops. They fetch the family's water supply, the fuel and firewood, and care for generally large families. Although they do much of Africa's work, women have little power. In many countries of sub-Saharan Africa, laws and customs exclude women from land ownership, education, job training, credit, and decision-making.[113] Deprived of economic and political power, African women find status and respect through childbearing,[114] a primary incentive for large families that has fueled Africa's high population growth rate. Then too, the pervasive cultural attitude among African men that masculinity is best demonstrated by fathering many children adds pressure upon women to bear children.[115]

Despite the fact that rural African women work 16 hours a day and produce the bulk of African foodstuffs, development schemes virtually ignore projects that would increase the productivity of African women.[116] Indeed, many development schemes fail because

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[108] Hearing Record at 434 (Brady); at 891, Ibid., Weiss.
[109] Hearing Record at 608 (Edelman); at 892, Ibid., Weiss.
[110] CRS Hearing Summary at 44–48; Hearing Record at 610–643 (Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa, AID, May, 1985, submitted by Edelman).
[111] Hearing Record at 803 (Smuckler).
[112] CRS Hearing Summary at 55–56.
[113] Hearing Record at 551 (Huston, Perdita).
[114] Faruqee and Gulbati, Ibid., at 52–53.
[115] Hearing Record at 935 (Green).
[116] Hearing Record at 558 (Fibre-Smith); Ibid., OTA Technical Memorandum, at 43–46.

they do not understand that women farmers have no extra time to devote to new programs. Dr. Christine Obbo testified,

> [W]omen are in fact overworked * * * if you are planning development projects, you don't ask women, who are already contributing 90 percent of the labor force to work a little more to improve development in these countries. Women are already the backbone, and we don't want to break the backbone; we want it to survive.[117]

Thus, several experts recommended that research efforts seek technologies and programs that increase the efficiency and reduce the workload of women in Africa.[118] Because African women spend many hours of the workday fetching potable water and fuel, small investments in well drilling and reforestation could alleviate the workload, freeing women for more productive tasks.[119]

Agricultural research has been geared to expert crops, instead of the foodstuffs raised by women for both family and commercial consumption. In addition, the special needs of African women subsistence farmers are rarely considered when developing and disseminating agricultural technology.[120]

Specifically, agricultural extension agents must be capable of dealing with women farmers. Several witnesses suggested that female extension agents would be more effective in training women farmers than men.[121] AID Africa Bureau Director Edelman said:

> I think we have to do more directly working with women. I mentioned earlier on * * * a project training women extension agents to go out and the response was just what you thought. It was terrific. * * * Clearly women can best address women.[122]

Witnesses stressed that if African women are to become more productive, several areas need immediate attention. Improved food security—better food storage techniques and easier access to markets—would greatly assist the female small farmers and, thus, the country.[123] Access to credit, education, and training would greatly improve the well-being of African women. Because women provide a "significant proportion of the total agricultural component of the Gross Domestic Product (GDP)" [124] for many African countries, enhancing their productivity has profound implications for the future of African development. Mr. Edelman of AID stated:

> * * * about opening up the opportunities for women in Africa, * * * they are the key to economic growth or key to agricultural production. They are key to so many things.[125]

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[117] Hearing Record at 573 (Obbo).
[118] Hearing Record at 573 (Obbo); at 559 (Fibre-Smith); Ibid., OTA Technical Memorandum, at 43–48.
[119] Hearing Record at 409–419 (Kramer); Ahmed, M., Ibid., at 45–47.
[120] Hearing Record at 573 (Obbo); Ibid., OTA Technical Memorandum, at 46–48.
[121] Hearing Record at 361 (Timberlake).
[122] Hearing Record at 120 (Edelman).
[123] Hearing Record at 576–580 (Obbo).
[124] OTA Technical Memorandum, Ibid., at 46.
[125] Hearing Record at 690 (Edelman).

Women's groups and clubs can provide assistance and peer group support for women's activities and learning. Such organizations can facilitate training in land-use management and provide family planning counseling.[126] Women's groups are also invaluable for assessing local needs, and provide an infrastructure for allocating development assistance.

Witnesses agreed that development efforts and improved family planning alone will be of little help in improving the status and well-being of women without a fundamental change in male attitudes regarding women's productive and reproductive roles.[127]

III. Recommendations

A. DROUGHT PREDICTION AND FAMINE MONITORING

1. To redress current limitations on drought prediction, U.S. agencies, including the National Oceanic and Atmospheric Administration (NOAA) and the National Science Foundation, should expand its national and international research on climatic change and long-range weather forecasting.[128] Research should address the basic causes of African drought, the global and regional factors involved, and the relationship between man-induced environmental changes and climate stability.

2. The U.S., through AID and the World Meteorological Organization, should improve the capability of African nations to monitor meteorological events.[129] Meteorological and agricultural monitoring stations should be established in Africa, funded adequately, and supplied with appropriate information. Providing satellite technology can be of significant benefit in this regard. With the ability to receive and interpret information from remote-sensing satellites, African scientists could better monitor their own weather and its consequences. In addition, communication systems among existing stations must be improved to facilitate data dissemination and early warnings of future weather abnormalities.[130]

3. The U.S. Department of Agriculture (USDA), NOAA, and AID need to coordinate their drought warning programs more effectively, both within the U.S. and with the drought warning programs operated by international agencies such as the World Meteorological Organization and the U.S. Food and Agricultural Organization.[131] More efficient coordination could improve the ability of the U.S. and Africa to respond to future crises.

B. POPULATION POLICIES

Discussion: Family Planning Programs

There was widespread agreement that the rate of population growth in sub-Saharan Africa must be curbed through improved family planning services and improvements in the economic status of women.

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[126] World Bank Population Report, Ibid. at 41; Hearing Record at 564 (Fibre-Smith); 939 (Green).
[127] Hearing Record, at 153 (Green).
[128] Hearing Record at 12 (Nicholson); 118 (Shukla); 20 (Rasmusson).
[129] Hearing Record at 118 (Shukla).
[130] Hearing Record at 20 (Rasmusson).
[131] Hearing Record at 927 (Hock); Hearing Record at 871–875 (CRS Monitoring Report).

Improved family planning programs are an important part of an overall strategy to curb population growth.[132] As stated by AID Africa Bureau Director Mark Edelman:

> Family planning efforts form an essential part of the equation to reduce pressure on natural resources and decertification. The prospects for achievement of enduring development are dependent on reining in the rapid population growth while expanding agricultural production in sub-Saharan Africa.[133]

The support of African governments and African leaders is a necessary precursor to the success of family planning programs.[134] The recent World Bank report on population in Africa concluded, for example, that "A strong government commitment to the legitimacy of family planning programs could tap the growing demand among Africa's people for the means to plan the number and spacing of their children." The report also went on to stress, however, that "The commitment of government leaders to the development of population policy must extend beyond lip service and be translated into effective action."[135]

The lack of convenient family planning services and the cost of those services pose major obstacles to increased contraceptive use. To address the large unmet demand for family planning services,[136] African governments should expand family planning programs, making them more accessible—particularly in rural areas—and less expensive.[137] Community-based distribution systems have also been found to be effective.[138] In addition, the record shows that family planning programs are more effective when a wide variety of contraceptive options are made available for consideration.[139] [140]

In addition to family programs offered through public health clinics, the private sector can play an important role by making family planning programs available for their employees through health care programs, and by making contraceptives available to the public at retail outlets.[141]

Expanded education programs about birth control are needed to counter ignorance about birth control methods. It is also critical that educational efforts be aimed at persons other than women with children, particularly young people, and adult men who are generally the family decision-makers.[142] Including men in family planning programs is particularly important because they are often hostile to use of contraceptives because of a deeply engrained cul-

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[132] CRS Hearing Summary at 16–24.
[133] Hearing Record at 659 (Edelman).
[134] Hearing Record at 163 (Issacs); 937 (Green); CRS Hearing Summary at 18–20.
[135] World Bank Population Report, Ibid., at V, 5.
[136] See discussion, Section II(c) supra; CRS Hearing Summary 16–17.
[137] Hearing Record at 164 (Issacs); 196, 201 (Speidel); 214 (Ofosu-Amaah).
[138] Hearing Record at 670 (Sinding); CRS Hearing Summary at 24.
[139] Hearing Record at 604 (Brown); 672, 688–689 (Sinding); 196 (Speidel).
[140] These recommendations address methods to prevent conception, not to terminate pregnancies. Indeed, while abortion is illegal in most African countries (Hearing Record at 175–176 (Issacs), the lack of ready access to contraceptives has caused an "epidemic" of illegal abortions. World Bank Population Report, Ibid, at 46–47; Hearing Record at 175–176 (Issacs); 195 (Speidel); 552 (Huston).
[141] Hearing Record at 177 (Issacs); 294 (Harris); 658 (Edelman); World Bank Population Report. Ibid. at 58, 63.
[142] Hearing Record at 223, 959 (Ofosu-Amaah); 207 (Harris); 984 (Huston); CRS Hearing Summary at 24; World Bank Population Report, Ibid. at 5.

tural bias in favor of large families and a traditional perception that manhood is judged by the ability to father large numbers of children.[143]

Recommendations

1. The United States should expand bilateral and multilateral support for family planning programs requested by African nations to meet the unmet demand for family planning services. The Agency for International Development should continue to expand its bilateral aid program to assist African nations to establish the type of family planning programs described above.[144] The U.S. should support international and multilateral aid agencies to assist African nations in establishing such family planning programs.[145]

2. The U.S. representatives to the multilateral development banks, including the World Bank and the African Development Bank, should encourage those institutions to make African leaders aware of the importance of population growth in meeting economic development goals. The World Bank in particular is in a unique position to influence Africa's views concerning the importance of family planning programs.[146] As stated by former Ambassador Green,

> Consciousness-raising is an activity in which the World Bank can and should play a major supportive role. Bank officials are beginning to recognize that they have a unique opportunity and responsibility to educate LDC leaders on the impact of population growth on the prospects for achievement of their development objectives during the ongoing policy dialogue.[147]

3. AID should support additional research on contraception and family planning strategies appropriate for Africa. Although effective family planning programs require an understanding of the factors involved in the choice and use of contraceptive methods, little is presently known about the particular factos involved in Africa. To ensure effective use of family planning program funds, AID should support research in Africa to address and identify the factors that affect African fertility and contraception decisions.[148]

In addition, research should also include new contraceptive methods.[149] Witnesses noted, for example, that available contraceptives, including current forms of male contraception, are often inappropriate for use in Africa.[150]

4. The U.S., through AID and its representatives to the multilateral development banks, should increase support for programs which improve the economic status of women. As noted by Stephen Issacs,

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[143] Hearing Record at at 200 (Speidel); World Bank Population Report. Ibid. at 52.
[144] CRS Hearing Summary at 20–23.
[145] CRS Hearing Summary at 20–23.
[146] CRS Hearing Summary at 24; Hearing Record at 195 (Speidel); 959 (Ofosu-Amaah).
[147] Hearing Record at 941 (Green).
[148] Hearing Record at 214 (Ofosu-Amaah); 231 (Segal Dr. Sheldon).
[149] Hearing Record at 955 (Speidel).
[150] Hearing Record at 959 (Ofosu-Amaah).

> Great attention should be given to educating and creating employment opportunities for women, perhaps the single most critical factor in reducing both fertility and infant mortality.[151]

Experience in other developing nations has demonstrated that increased literacy and education for women are important precursors to decreased fertility and participation in society.[152]. Mr. Steven Sinding, director of AID's Office of Population, noted:

> From my own experience in a number of Asian countries, and more recently in Africa, I have become personally convinced that until alternative roles for women are found they won't be interested in limiting family size. * * * We believe that the provision of family planning services to that proportion of the population which is interested in limiting family size is a key factor in changing and improving the role of women. Because without access to family planning services it becomes very difficult for many women to cease having children that they don't want and to engage in other productive activities.[153]

Donor and host governments should be encouraged to improve educational, social, health, economic, and legal rights of women in order to provide alternatives to childbearing.[154]

C. NATURAL RESOURCE MANAGEMENT

1. Given the relationship between natural resources and sustainable development,[155] AID and the multilateral development banks should emphasize natural resource management and rehabilitation.[156] Presently, however, the Agency for International Development (AID) and other large aid agencies often fail to provide strong support for environmentally-sound development, in part because they lack the environmental expertise and technology.[157] Several steps should be taken to address this problem.

> AID should create a bureau within the agency, staffed by environmental scientists, devoted to environmental planning in all its programs.[158]
>
> AID should fund projects through Private Voluntary Organizations (PVOs) which have demonstrated the ability to mobilize local support for sustainable natural resource management efforts.[159]
>
> AID, The State Department, U.S. Department of Agriculture, and Environmental Protection Agency (and possibly other agencies) should expand research on "appropriate" conservation technologies, which are adapted to the social, economic and physical environments in which they will be applied; and

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[151] Hearing Record at 245 (Issacs).
[152] World Bank Population Report, Ibid. at 38, 48.
[153] Hearing Record at 692 (Sinding).
[154] World Bank Population Report, Ibid. at 39.
[155] Hearing Record at 176 (Issacs); World Bank Population Report, Ibid. at 39.
[156] CRS Hearing Summary at 34-36.
[157] Hearing Record at 279 (Speth).
[158] Hearing Record at 279-283 (Speth).
[159] Hearing Record at 287-289 (Speth); 816-818 (Stoehl, Thomas).

conduct research on factors which affect the successful implementation of such technologies.[160]

AID should increase its funding of natural resource and environmental management training and should make this training an integral part of each nation's development strategy.[161]

AID and other donor agencies should support the efforts of the United Nations Environment Program to create and increase effectiveness of host country environmental agencies.[162]

AID should supply African natural resource agencies with information from remote-sensing satellites and other sources that detail rates of desertification, deforestation, crop stress, and other environmental degradation.

2. In the short term, AID, the multilateral development banks, and other international development agencies (such as the Food and Agriculture Organization) should devote more resources to developing higher-yielding, more resilient food crops for Africa, employing biotechnology as well as traditional breeding techniques.[163] In addition, USDA should encourage U.S. agricultural research universities to undertake more basic research for developing technology appropriate for small scale, arid zone farmers and for understanding the principles of sustainable agriculture (e.g., nitrogen fixation, the roles of microorganisms, soil interactions, etc.).[164]

3. The U.S., through AID and its representatives to the multilateral development banks, must make a long-term, sustained commitment to develop an adequate agricultural research capability in Africa,[165] and African nations themselves must invest more to establish credible agriculture research programs. With the following modifications, the Committee supports the AID paln for building agricultural research capability in Africa:[166]

Given the importance of women to agricultural development,[167] the AID plan should ensure that a significant portion of scientists, technicians, extension workers, and research farmers be women.

To insure that these locally developed technologies are sustainable, AID should integrate natural resource rehabilitation and management into the training of African agricultural scientists.

The plan must address the conditions that currently constrain the effectiveness of scientists in Africa: the lack of prestige and financial reward, nepotism and favoritism, and excessive non-research workloads.

4. Development agencies (AID), the World Bank) should fund projects that make use of appropriate agricultural technologies,[168] especially methods adapted from indigenous sustainable agriculture practices.[169] Appropriate technologies are those that are

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[160] Hearing Record at 289–291 (Speth).
[161] Hearing Record at 292–294 (Speth); 816–818 (Stoehl).
[162] Hearing Record at 283–287, 314–315 (Speth).
[163] Hearing Record at 446–447 (Brady).
[164] Hearing Record at 877–880 (Podale, Robert).
[165] CRS Hearing Summary at 44–48.
[166] CRS Hearing Summary at 44–48.
[167] CRS Hearing Summary at 55–62.
[168] CRS Hearing Summary at 43–44.
[169] CRS Hearing Summary at 34–39.

adapted to the social, economic, and physical environment in which they will be applied. These agencies should also focus on small-scale projects at the local and village levels.

Successful implementation of such agricultural technologies depends on several factors: the use of techniques consistent with local social, religious, environmental, tribal, political, cultural and economic conditions; support for these techniques at both local and national levels; and the degree to which the user profits from the technology. Development agencies should consider these criteria when considering implementation of a new technology.

5. There are many promising techniques developed in semi-arid regions (such as Israel and the western U.S.) which could be adapted to Africa.[170] The Committee recommends that research focus on the adaptation of these technologies to the economic, social and environmental conditions of sub-Saharan Africa.

D. THE ROLE OF WOMEN IN DEVELOPMENT

1. African agricultural extension services should be designed and implemented with the small farmer in mind.[171] The U.S. should support the development of such extension services through AID and its representatives on the multilateral development banks. In particular, since small famers are typically female, AID should encourage the use of more women extension agents who should communicate directly to women in the community.

2. AID should support funding for research on the development of time-saving and energy-saving technologies for women farmers.[172] African women are already overburdened with work, and new technologies can succeed only of they relieve that burden.

3. Women's groups in Africa offer an important means of communication with Africa's women. AID programs should encourage, and where appropriate, work with such groups to convey training and information relevant to women as farmers and producers.[173]

4. The economic, legal, and social status of women must be improved.[174] The U.S., through AID and its representatives to the multilateral development banks, should encourage needed reforms which improve access to skills and training, jobs, credit, land-ownership, education, and family planning services.

E. DEVELOPMENT BANK LOAN POLICIES

Since developing countries cannot afford loans for family planning, training and other programs which do not generate sufficient income to pay back loans granted at commercial interest rates, the U.S. should encourage the World Bank and the African Development Bank to make loans available at concessional rates for these types of programs.

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[170] Hearing Record at 362-365 (Irwin-Williams); 514-516 (Aronson, Dr. James).
[171] CRS Hearing Summary at 58-59.
[172] CRS Hearing Summary at 59-60.
[173] Hearing Record at 939 (Green).
[174] CRS Hearing Summary at 58-61.

IV. Conclusion

The task of restoring Africa's capacity to feed itself will not be an easy or an inexpensive one. The rescue effort will require an unprecedented, long-term, sustained, multi-disciplined, and well-funded effort by the developed nations.

A new consensus is emerging among development experts, environmentalists, agriculture specialists, and African leaders that Africa's food security can be improved through development programs that focus on the concept of sustainability and appropriate technology, the integration of African women into the economic mainstream, the restoration and maintenance of the natural resource base, the development of African expertise in natural resource management, and the reduction of population growth rates. Increasingly, experts agree that the technology, knowledge and skill needed to avert future famines exists.

The question remains, however, whether the United States and the other developed nations can sustain the political will to help in Africa's development. While the costs of aiding Africa may be high, the costs of failing to aid Africa may be incalculable.

APPENDIX

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ISSUES RELATED TO HUNGER IN AFRICA:

DROUGHT, POPULATION GROWTH, ENVIRONMENT AND NATURAL RESOURCES, AND AGRICULTURAL DEVELOPMENT

Summary of Hearings Held
September 19, October 17, 23, 30, and 31, 1985

Prepared for the Use of the
Subcommittee on Natural Resources, Agricultural Research and Environment,
House Committee on Science and Technology

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I. Introduction

The Subcommittee on Natural Resources, Agriculture Research and Environment of the House Committee on Science and Technology held five days of hearings on aspects of the African crisis focusing on the interrelationships among climate, population, environment, and agricultural activities in sub-Saharan Africa, and the prospects for sustainable development and long-term research needs.

Congressman James Scheuer, Chairman of the Subcommittee, in his opening remarks outlined the areas of concern that would be addressed throughout this set of hearings:

> "...we are going to be approaching this problem of hunger in Africa not from the simplistic point of view of simply giving aid but from the point of view of helping Africans make the decisions on every aspect of their development policies affecting food production, treatment of their natural resources, considerations of population growth, and some of the programs that will inhibit population growth, not only family planning but basic changes in the role of women and the status of women that give women and young couples an incentive to restrict population growth.
>
> ...we are dealing with a very challenging, a very interrelated, a very complex web of problems, a seamless web of problems."

The hearings were organized as follows over the five days: On September 19, 1985, the Subcommittee focused on drought and climate in Africa; on October 17 it examined population growth and pressures; on October 23 and October 30 the Subcommittee addressed appropriate technology for Africa including the role of women in Africa; and on October 31 the Subcommittee considered long-term solutions to the African food crisis.

Following is a summary of the issues raised in the hearings, presenting some of the highlights of the testimonies and the solutions that were offered by the witnesses. Appendix I on page 63 provides a detailed list of the witnesses who participated in the series of hearings on "Africa and Hunger: Prospects for Sustainable Development."

II. Drought and Climate in Sub-Saharan Africa*

The widespread drought and famine which devastated sub-Saharan Africa during 1985 prompted the Subcommittee to turn its attention first to issues concerning the nature, extent, and causes of drought and climate change in Africa. These and closely related issues, including the need for research on African weather and climate change, international cooperation in the meteorological and climatological spheres, and U.S. capability to monitor and forecast drought, were discussed by a number of expert witnesses. The Subcommittee started from the premise that drought was only the tip of the iceberg, as Chairman Scheuer put it, in terms of explaining the causes of food problems in Africa. Nevertheless, it was considered critical by the Subcommittee to understand the relationships of weather and climate to food problems in Africa, as well as to determine the capacity of U.S. government agencies to monitor and anticipate drought and famine conditions.

Extent of the African Drought

Altogether, 20 countries in sub-Saharan Africa experienced drought and famine during 1985. Dr. Sharon Nicholson of Florida State University testified that the area affected by drought in the sub-Saharan region was about three times the size of the continental United States. However, there are differences according to Dr. Nicholson, in the nature and extent

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*Prepared by Charles Hanrahan, Specialist in Agricultural Policy, Environment and Natural Resources Policy Division, Congressional Research Service.

of the drought in different regions of Africa. The Sahelian region of West Africa has been experiencing a very long period--fifteen to twenty years--of declining rainfall. In the Sahel, a seven-country region on the southern fringe of the Sahara Desert, rainfall in the 1970s and 1980s has declined by about 50 percent from levels attained in the 1950s and 1960s. In contrast, the eastern and southern portions of Africa have experienced shorter, and more intense dry spells.

Causes of the Drought

During this first hearing, the Subcommittee focused attention on the causes of the African drought and of longer term climate change. Two of the expert witnesses, Dr. Eugene Rasmusson of the National Oceanographic and Atmospheric Administration and Dr. Jagadish Shukla of the University of Maryland, addressed these issues specifically.

According to Dr. Rasmusson, recent developments in meteorology provide better understanding of short-term variation in rainfall than of long-term climatic declines in precipitation. Dr. Rasmusson noted that major sources of variation are changes in the tropical oceans and possibly changes in vegetation on the land surface.

> ...the processes associated with the long-term down trend in the Sahel are not at all clear.... There are some indications that it is associated with a sea surface temperature change in the tropics around the entire global belt.... It also invites speculation as to the possibility that it (weather variation) is involved with the environmental degradation that has been going on, the demonstrated deforestation and desertification.

While the association of weather variation with sea and surface change is well established, the cause and effect of these associations is not known.

Dr. Shukla also commented on the relationship between changes in the land surface and weather changes in Africa. In his view:

> ...local changes in land surface properties can produce changes in the climate which are consistent with the kind of trend that we are seeing.... there is no evidence that the local changes are the cause of producing such a change, but there is good reason to believe that they might be amplifying an already existing effect due to global factors.

Weather and Climate Research

The evident lack of certainty about the causes of drought and climate change in Africa, and indeed elsewhere in the world, raised the issue of the need for meteorological and climatological research. Drs. Nicholson, Rasmusson, and Shukla all addressed the need for and nature of the research effort required.

Conducting research on African weather and climate is made difficult by the inadequacies in the data available to researchers. Dr. Nicholson pointed out that not only are data in short supply, but also in some cases there may even be less data available today for research than were available 15 to 20 years ago, because of the deterioration in meteorological services and inadequate archiving of existing data. There is a great need, she indicated, to assist African governments in archiving existing data sets and in maintaining current meteorological sets. Satellite imagery can be used in the absence of more conventionally generated data.

A major area for research, according to both Drs. Rasmusson and Shukla, is the relationship between sea surface temperature, in the Pacific Ocean and climate and rainfall variability in Africa. The important question is how sea surface temperature changes affect atmospheric circulation over Africa and Africa's precipitation regime.

Research focusing on drought not only would improve capacity to deal with Africa's weather problems and consequences, but would also have applications in other parts of the world, including the United States. Such Africa-oriented research would, according to Dr. Rasmusson, improve our understanding of the basic mechanism of droughts, whether they occur in the Sahel of West Africa or the cornbelt of the United States.

The capacity of meteorologists and climatologists to research the causes of drought and long-term weather variation has been enhanced, according to Dr. Shukla, by advances in mathematical modelling of weather and climate. There is some question, however, as Dr. Rasmusson noted, about whether models can be developed to answer questions about the relationships or influence of land use changes and variations in vegetative cover on climate and weather variability in sub-Saharan Africa.

International Cooperation Programs

The World Meterological Organization (WMO) plays a major role in collecting data for monitoring and forecasting droughts and in conducting or supporting research on world weather and climate. The United States, through the U.S. National Weather Service, provides meteorological data and training for meteorologists in African countries.

Dr. Rasmusson pointed to two of WMO's international research programs in which the United States cooperates and which are particularly important for enhancing understanding of weather and climate change. One program, the Tropical Ocean and Global Atmosphere program (TOGA) aims to determine how the tropical oceans affect the atmospheric circulation. The other

is the International Satellite Land-Surface Climatology Project (ISLSCP) which aims to use satellite data to monitor surface conditions.

U.S. Monitoring and Forecasting Capability

The Subcommittee was very interested in gauging the capacity of U.S. Government agencies to carry out monitoring and forecasting of droughts and food problems in Africa. The Subcommittee was also concerned about coordination among the various agencies with monitoring and forecasting responsibilities. A background paper, "Monitoring and Forecasting Drought and Famine," prepared for the Subcommittee by CRS identified the various agencies with monitoring and forecasting programs, described how each program used advanced information technologies such as satellite imagery and computers, and discussed coordination of agencies which forecast drought and food supply problems globally.

The National Oceanographic and Atmospheric Administration (NOAA) is one of the principal agencies that uses satellite technology to forecast crop conditions and anticipate food problems. Dr. Joan Hock of NOAA's Assessment and Information Services Center in the Environmental Satellite, Data and Information Service (AISC) testified about her agency's role in monitoring and forecasting drought and famine. NOAA's program, funded by the Agency for International Development (AID), uses satellite imagery from polar orbiting meteorological satellites to monitor and assess weather conditions in Africa and in other developing regions of the world. The AISC reports its assessments to AID missions in the developing countries, where these satellite assessments can be used in conjunction with conventional

data on agricultural conditions to make drought assessments and determine likely effects on food production and consumption.

Congresswoman Schneider asked Dr. Hock to assess the current extent of coordination between NOAA and other U.S. government agencies with monitoring and forecasting programs, especially the U.S. Department of Agriculture, the National Aeronautics and Space Administration, and AID. Dr. Hock noted that currently, coordination is carried out by a task force with participation by USDA, AID, and NOAA. Both Chairman Scheuer and Congresswoman Schneider expressed interest in long-term plans for more effective interagency coordination of monitoring and forecasting activities.

African Country Capacity to Monitor and Forecast Weather Conditions

What is the capacity of African countries to carry out monitoring and forecasting themselves? All of the witnesses indicated that the African countries have little capacity to do this kind of work. Not only are data lacking, as stressed by Dr. Nicholson, but meteorological services are weak and ineffective. Dr. Shukla proposed that:

> ...the United States take a leadership role in organizing and developing an international plan for improvements in the weather services of the African nations and contribute towards its implementation by the WMO.

In addition, he stressed that training of local people is needed to maintain meteorological services in countries where the data would be regularly collected. Other needs include upgrading communications facilities for receiving satellite images as well as for transmitting data to international networks such as the WMO's World Weather Watch.

Summary of Recommendations

A number of recommendations for improving the ability of the United States and the developing countries to monitor, forecast and respond to droughts and famines emerged during the hearings. The major recommendations offered on September 19 are as follows:

—Support for long-term research to determine the causes of short-term and long-term variability of weather. Although targeted on processes that create drought and long-term weather variability in Africa, this research would have more general applicability, including enhancing understanding of the causes of droughts in the United States.

—Strengthen support for WMO. Drs. Rasmusson and Shukla expressed support for greater participation by the United States in data collection and dissemination, as well as research programs of WMO.

—Strengthen the capacity of African countries to monitor and forecast drought. Testimony indicated that the United States could play a major role in building the capacity of meteorological services in Africa through bilateral programs such as the training associated with NOAA's assessment work for AID, or through the World Weather Watch and research programs of the WMO.

— Improve interagency coordination of monitoring and forecasting. Several U.S. Government agencies are involved in the use of advanced information technologies to monitor and forecast weather and crop conditions around the world. More efficient coordination would be desirable and could lead to improvements in the U.S. response to crises such as the recent African famine.

III. Population Growth and Related Issues*

Over the past several decades, sub-Saharan Africa has experienced the highest population growth rates ever experienced by human society. These high rates of growth, according to various witnesses, exacerbated many other problems—famine, declining per capita food production, environment and resource degradation, unemployment, and continued health problems. There are many underlying social, economic and political factors as well, and these factors, as well as related U.S. and African government policies on population, were discussed at length during the hearings.

Although all of these problems and underlying issues were brought up throughout the five days of hearings, the subject of population was explicitly addressed by the hearing on October 17, 1985. Except where noted, the summary below is based on testimony presented that day.

Overview: Current and Projected Growth Rates

The growth rates in Africa, averaging around 3 percent per year and soaring to over 4 percent in some countries, produces large increases in population over relatively short periods. As Chairman Scheuer noted in his opening statement,

> Experts predict that in 20 years from now there will be a second Africa, equal to the size of the current Africa, of about 435 million... in other words, in two decades with a population rate of a little over 3 percent, sub-Saharan populations will double.

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*Prepared by Susan R. Abbasi, Specialist in Natural Resources Policy, Environment and Natural Resources Division, Congressional Research Service.

Congresswoman Claudine Schneider noted that the current rate is up from some 2.5 percent in the 1960's, and characterized the situation as a crisis:

> Now this growth rate is the highest in the entire world, and it also happens to be the highest in the history of mankind.... I think that as we look at these statistics we can recognize that we are looking a crisis in the face right at this time.

The Subcommittee's background paper from CRS, "Population and Natural Resource Deterioration in Drought-Stricken Africa," documented that population growth has more than doubled during the period 1950 to 1980 for all the six countries studied and includes projections for more than doubling in the next 35 years.

Several witnesses noted that most sub-Saharan countries had experienced no declines in growth rates, nor do they show evidence of the indicators pressing such declines--such as lower infant mortality, proportion of urbanization, and illiteracy.

Dr. Teitelbaum indicated that most population projections are based on assumptions that such declines will occur even though they are not in evidence yet:

> The most recent U.N. projections, which I should emphasize all include rather optimistic assumptions concerning fertility declines--they are assuming fertility declines that have not appeared yet in some important countries of sub-Saharan Africa--in any case, these projections show that the 1985 African population, taking the continent as a whole, of just over 550 million, would be expected to rise nearly 200 percent by 2025 to 1.64 billion.

Other comparisons included Werner Fornos' who pointed out that at current growth rates in 76 years Nigeria's population would be larger than China's today, and Kenya in 2065 would have twice the population as the United States.

As the testimony proceeded, witnesses covered demographic trends of various kinds: factors responsible for continued high fertility, the impacts of rapid population growth and the role of U.S. policy and African governments' policies and their future options.

Demographic Trends

Witnesses noted a number of demographic trends associated with Africa's population growth, including urbanization, population density, age structure, and migration patterns. All of these trends contribute to impacts of population growth discussed in a later section of this summary. Africa is unique among the world's regions and in its historical pattern in several of these trends.

Michael Teitelbaum, of the Sloan Foundation, provided a comprehensive overview of the demographic trends in sub-Saharan Africa. In addition to the lack of declines in growth rates, he noted that some countries are experiencing an increase in fertility rate as health of women has improved.

With respect to density of population, Africa is the most sparsely populated continent in terms of people per square mile. Although some areas are densely populated, others--often resource-poor areas--are relatively empty of people. Dr. Teitelbaum stated:

> A second important characteristic that differentiates sub-Saharan Africa from much of the rest of the world is its relatively sparse population density, if one compares population to land area. For example, in sub-Saharan Africa this crude measure of population density is less than one-fifth that of Asia...

He went on to say that the implications of this vary greatly:

> There are some very favorably endowed countries in sub-Saharan Africa that are very sparsely populated and have tremendous potential for supporting larger populations. There are others that are exceeding their capacity to support their populations already.

Other witnesses pointed out that the very large distances between human settlements pose problems for development, transportation, communication, etc., whether an area is resource-poor or has potential for greater productivity.

Urbanization trends in Africa present dilemmas. Dr. Teitelbaum pointed out that Africa has experienced less than the rest of the world as evidenced by its very low level of urbanization. Just under one-third of the population are living in cities in Africa compared to 69 percent in Latin America, and 74 percent in Europe and North America. However, other witnesses noted that the rapid population growth has pushed large numbers to migrate to the cities. In fact, the size of urban concentrations is growing rapidly, and the proliferation of actual numbers in cities has led to policies that favor low food prices and other measures to minimize urban unrest.

Dr. Teitelbaum noted the self-reinforcing aspects of these trends:

> ...it is the urban population that is the source of political instability,...the source of political threat, and it is for this reason that many countries in this region have kept down prices for food paid to the farmers of these countries. The result has been impoverishment for the farming populations, a reduction, if anything in food production, and certainly incapacity to raise per capita food production and a tendency to accelerate rural-to-urban migration.

Historically, higher proportions of the population in urban areas has been strongly correlated with a drop in fertility rates. And, as Dr. Teitelbaum pointed out, projections for Africa indicate a continuation of relatively low urbanization rates. He estimated for example, that in the year 2000, 42.2 percent would be urban.

The age structure of Africa is another important demographic factor. Due to the very high population growth, the proportion of the population below the age of 15 is extremely high. This high "dependency ratio"--45 percent of population is less than age 15 in 1980--means that the momentum of growth will continue as these children grow into their childbearing years. Whether

they opt for smaller families or not, the sheer number of people of productive age will produce continued increases in the population, depending on how fast the fertility rate declines. The potential roles of growth over the next few decades will differ greatly. Using the example of Nigeria, Dr. Teitelbaum described the implications of this built-in momentum:

> The main point is that even with rapid fertility declines, the momentum of Nigerian population growth can be expected to double or triple its size; barring catastrophe, Nigeria seems likely to have a population as large as that of the USSR or USA today. The other point worthy of note is how large a difference in eventual population size is determined by the rapidity of the fertility decline--ranging from 243 million to 471 million (in 2050) in the Nigerian case.

A final trend noted by Dr. Teitelbaum and other witnesses was the fact that Africa's population is comprised of a very large number of refugees--2.5 million in 1984, which makes planning and social stability difficult in many areas.

Impacts of Rapid Population Growth

In addition to the implications of population growth trends already mentioned, such as age structure and growth momentum, several witnesses referred to the social and political problems that such rapid growth portends.

Ambassador Marshall Green and Werner Fornos drew attention to ecological consequences, such as growing human populations attempting to graze ever larger herds in fragile arid areas.

Ambassador Green also pointed out the "push" phenomenon from growing rural populations responsible for migration to cities, rather than the "pull" of urban employment that had caused such migration in the industrialized countries. The implications for unemployment in the heavily

rural African economies are severe, Ambassador Green found. He quoted a Kenyan official who said the economy can produce some 50,000 new jobs per year, but there are 250,000 entrants to the job market each year. Ethnic and tribal tensions were exacerbated, Ambassador Green indicated, when population growth forces people to leave their tribal lands and live in close proximity with former tribal rivals.

Other social impact noted by Ambassador Green and other witnesses included poor health conditions--a serious concern when populations grow so rapidly that provision of safe water, sanitation and health services cannot keep up. Falling per capita food production, due in large part to population growth, meant that human nutrition especially that of children suffers. Education services also cannot keep up with such rapid growth, and literacy remains at very low levels. As noted by several witnesses, increased child survival, literacy and education are important precursors to decreases in fertility and slower growth.

Social Factors Responsible for Existing Trends

Direct causes and effects of existing trends are difficult to establish. A complex web of social, economic and political factors underlie current population trends in Africa. There was widespread agreement among the witnesses concerning social factors and the complexity of their interactions, although each witness did not necessarily emphasize the same factors.

High desired family size. One key determinant of current growth rates is the continuing desire for large families among African people. Average desired family size is in the range of 7 to 9 children. Witnesses identified a number of reasons for this.

Mrs. Ofosu-Amaah noted that children are considered the primary social security system in old age:

> Since about 70 percent of Africa's populations live at subsistence level, social security systems or alternative institutions have not been developed to cater for the needs of old age. Children are therefore looked upon as an economic asset and as security in old age and at other periods of disability.

In addition to their role as future providers of social security, children are a basic economic asset in a predominantly rural economy—they provide useful economic services in the fields, and contribute to household labor.

Mrs. Ofosu-Amaah stated:

> Sub-Saharan Africa is predominantly agricultural with heavy dependence on traditional and subsistence methods of farming.... Under the present system of farming, therefore, child labour is extensively used and thus the need for large family sizes. A family's status and wealth in such agrarian societies are assessed on the basis of its size. In Africa, however, even in the urban areas, where some modernization has taken place and agrarian pursuits are of less importance, a large family is still a status symbol.

High infant mortality, several witnesses noted, distinguishes most of Africa's poor countries and leads to a desire to have numerous children in order to assure that some survive. Although improved survival of children is evident in some countries, it is not yet high enough, nor is it sufficiently perceived, to have worked against high desired family size to date.

The current status of women in African society contributes to a desire for many children, since women's main role is seen as being the childbearer, with few other methods of attaining status.

Early Age at marriage. Marriage at an early age is characteristic of most African societies. Mrs. Ofosu-Amaah pointed out that in Ghana the median age at first marriage is about 18.1 years; only about 5 percent in the age group 25-29 are still unmarried. This means that childbearing begins at an early age, contributing to large family size.

Contraceptive use. Contraceptive use is low in Africa--about 10 percent of those in childbearing years are using contraceptives, witnesses pointed out. While this is due in large part to large desired family size, Mr. Speidel stressed the large unmet need. Where contraceptives are made available in Kenya, 40 percent of the Nairobi population uses contraceptives. A World Fertility Survey, he said, found that between 4 to 16 percent of those surveyed wanted no more children, and between 23 and 60 percent wanted to delay having a child. Compared to the small percentage using contraceptives, these data indicate a large unmet need for contraceptives.

Ambassador Green noted that a number of factors that had limited fertility and/or population growth in the past have been broken down by "winds of change"; these factors included high infant and child mortality, infertility from disease and poor nutrition, various cultural practices like abstinence during nursing periods, and polygamy. While these have been dissipated, modern substitutes have not replaced them.

Another factor contributing to low levels of contraceptive use, Mrs. Ofosu-Amaah indicated, is the linkage of family planning services to the health system.

> Since these services reach only between 25 to 30 percent of Africa's populations (i.e. mainly in the urban areas), accessibility, proximity, frequency of services and the ready availability of supplies leave much to be desired.

She suggested that the lack of involvement of local community organizations and the failure to include men in population and family planning programs also contributed to less widespread contraceptive use. Nancy Harris also commented on the need to include men in family planning and education programs, since "they are the decision-makers."

Mrs. Ofosu-Amaah elaborated on this in her answers to questions submitted in writing:

> A rapid change in male attitudes towards family planning can be achieved if males have the knowledge about family planning and are made to understand the pros and cons of having large families. So far, the propagation of the family planning "message" has been very limited in Africa and has not reached most males. This may be one of the reasons for the low rate of contraceptive use in Africa.

Lack of indigenous leaders in family planning. Dr. Sheldon Segal cited the scarcity of local leaders and scientists in family planning research and development. He stressed that the contraceptive tools do exist, but means must be found to make them widely available, something best done by local leaders.

General economic and social conditions. Mrs. Ofosu-Amaah stressed the need to place family planning efforts in a properly understood social context, and to deal with the associated factors such as female education and employment, child survival, and economic conditions. She expressed concern:

> One is not looking at some of the other developmental programs that, in the African context, will have any appreciable impact on fertility reduction...

Until the desire for large families is understood in its full social and cultural context, she emphasized, family planning programs will not be implemented successfully.

> The most important, in my view, is the failure by program planners to appreciate the intensity of desire for large families, the psychosocial process which govern the establishment of family size norms...and the point in time at which this becomes ingrained in African men and women....Until these psychosocial factors are understood and until the correct interventions are applied at the appropriate time in a woman's life, these will continue to be a barrier to the successful implementation of programs.

Ambassador Green linked the general economic crisis facing most African nations to problems in dealing with population problems. Among other things, he said, it is difficult to fund social services which are essential to improving the status of women with regard to literacy and health. Also, the economic crises create high unemployment among males, which "greatly complicates the task of finding meaningful job opportunities for women."

African Government Policies

Most of the witnesses agreed on the key role of the African governments in encouraging family planning and carrying out programs for education and contraceptive dissemination.

In areas of the world where fertility has declined since World War II, the role of government policy has often been strongly supportive of population programs. Dr. Teitelbaum noted:

> It is important to note that in ...most cases of post-war fertility declines, government policies have served to accelerate and expedite the demographic trends.

Dr. Isaacs provided examples where this was the case and noted some exceptions, but stated the general influence of government policy on public values:

> However, population policies can be important as expression of government policy and will. They establish a climate whereby family planning becomes more acceptable and lower fertility becomes the acceptable norm.

Change in attitudes. Several witnesses noted the rapid change in attitudes on the part of some African government leaders over the past five to ten years, from a situation in which "even the mention of the word 'population' was taboo" to one in which increasing numbers of countries have family planning/population components in economic plans.

Ambassador Green noted that only two African countries had population policies in 1974, whereas 13 countries now have such policies, and African leaders are more receptive to discussion of population growth issues. Dr. Isaacs stated that within the past 7 years, 8 African countries have established population or family planning commissions or councils, two within the past year.

Slow implementation. Despite changing policies, witnesses also agreed that actual implementation and progress has been slow, hindered by several factors. Dr. Isaacs stated:

> Nonetheless, on the action side progress has been slower. Thirty-one of the 45 countries surveyed by the United Nations in 1983 said that they supported family planning, albeit two-thirds of those did so indirectly through a private planning association, through provision of hospitals or clinics or so forth. A survey that was undertaken quite recently and printed in the World Bank's 1984 development report characterized all of the family planning programs of Africa as weak or very weak, and I should say that it is still such a sensitive issue that it must be referred to and indeed justified as 'birth spacing' rather than using the words 'family planning' throughout most of Africa.

Problems in effecting changes were described as follows by Ambassador Green in terms of difficulties faced by African leaders:

> --Continuous changes of government make it most difficult, if not impossible to have a sustained program in population or in other fields;
>
> --Leaders everywhere tend to be most concerned with immediate issues, and population unfortunately is one of the longest-range.

--Furthermore, there is very little political benefit in population programs. Oft-times one runs risks with religious leaders...and others...

Oh yes, they make fine declarations and declaratory support is great, but in terms of implementing measures, I'm afraid they are very short.

Dr. Teitelbaum reiterated the key role of governments in taking actions in the short term that will have far-reaching implications for their societies:

In my judgement, Mr. Chairman, the future of the continent will be significantly affected--by no means is this the only factor, I should emphasize that—but significantly affected by the degree to which its governments are willing and able to cope with the demographic trends that seem to be certain, barring catastrophe. In addition, in view of the long-term momentum of demographic change, much will depend upon their foresight, upon willingness and competence among African leaders to undertake judicious measures in the near future that might have moderating effects on demographic change over the very long term.

Ms. Harris pointed to Zimbabwe as a success story, and indicated that in facing the problem of dissemination of information and contraceptives, the commercial sector provided an example of the best available distribution system. She indicated that government policies which encouraged use of private sector distribution systems might be the most effective:

I think we have very poor progress in (using) the commercial sector, and part of that is due to the policy side that governments have to be encouraged to promote. That is the best distribution system in Africa: any village, you can get a Coca-Cola. And if we can encourage distribution of contraceptives through more commercial means, and less restrictions on the contraceptives coming in--less duty—we could (tap) those distribution networks we could use right away.

U.S. Policies on Population Assistance

A major focus in the remarks of several witnesses was the current U.S. policy on providing assistance to international family planning efforts. Among these witnesses and all those testifying on October 17, there was

agreement that the current reduction or termination of funding of international programs represented a set-back in progress toward family planning efforts in Africa at just the time that the leaders in Africa were perceiving the need for such programs.

Funding cutbacks for population programs. In particular, there was agreement among witnesses that the cutbacks and termination of funding for international multilateral programs, in which funding for family planning is channeled through U.N. or private organizations, were particularly damaging. None of the witnesses specifically presented the arguments made by the Administration favoring these cutbacks and the new emphasis on natural family planning techniques. Werner Fornos stated:

> Unfortunately, just at a time when population programs should be accelerated, current U.S. policy amounts to a giant leap backward. Last year the U.S. cut off $17 million in funding for the International Planned Parenthood Federation, the largest private organization providing family planning assistance to the developing world. This year the U.S. has cut off $10 million of a grant mandated by Congress to the United Nations Fund for Population Activities, the largest multilateral provider of family planning assistance to the developing world.

In her answers to post-hearing questions, Mrs. Ofosu-Amaah stressed the value of positive leadership by the U.S. in past years, and the importance of the work done by these organizations, and she cited the "dismay and incomprehension" of African policymakers over recent U.S. actions:

> In the past 12 to 15 years, the U.S. has played an important leadership role in encouraging family planning in the developing countries through regular annual increases in U.S. family planning aid....These organizations (UNFPA, IPPF, and U.S. AID) have been very influential in the move to get the governments of developing countries to understand and appreciate the importance of the population problem.
>
> Recent changes in U.S. foreign population assistance policy have caused dismay and incomprehension among policymakers

in sub-Saharan Africa, since these changes are being made at a time that many African countries are beginning to change their attitudes towards family planning.

Policies in U.S. AID were discussed, witnesses noting the expansion of funding and personnel in the bilateral, government-to-government program, but also expressing strong disagreement with the new U.S. policy to provide this funding for programs that would advocate "natural" family planning based on periods of abstinence, without referrals to other contraceptive methods. Several witnesses felt this would be not only an ineffective method, but also unacceptable to many Africans.

The distinction between multilateral and bilateral programs and their impacts were described by Ambassador Green in his written responses to post-hearing questions:

> The potential impact on Africa of the termination of support for the International Planned Parenthood Federation (IPPF) and the possible withdrawal or reduction of U.S. contributions to the United Nations Fund for Population Activities (UNFPA) is enormous. In FY 1986, AID has requested $23.9 million for bilateral population programs in 8 African countries. The funding level is a significant increase over the FY 1985 level of $14.6 million, but bilateral aid does not reach the vast majority of African countries. In contrast, multilateral and nongovernmental organizations reach over 40 countries and contribute in excess of $50 million annually.
>
> The small number of bilateral programs combined with the low capacity of African governments to absorb effectively population assistance make multilateral and private funding channels especially critical in sub-Saharan Africa. Moreover, African governments have a strong preference for multilateral or PVO (private voluntary organizations) channels, as opposed to bilateral government channels, when it comes to a sensitive field like family planning.

Dr. Isaacs noted the key role that foreign assistance plays in light of current economic crises in Africa:

> Given the deterioration of African economies and the scarcity of foreign exchange, even in oil-producing countries such as Nigeria, it is evident that foreign assistance will be necessary to help those African countries wishing to reduce their population growth rates. The major donors are the U.S. Agency for International

Development, the World Bank, the United Nations Fund for Population Activities and the International Planned Parenthood Federation. Funds to IPPF have been slashed; the UNFPA has had its funds reduced and AID is not, according to my information, planning to increase its funds for population activities in sub-Saharan Africa. This leaves only the World Bank, which by and large lends money at commercial interest rates. Many developing countries, worried about guarding scarce foreign exchange and already burdened with problems of debt servicing, are unwilling to accept loans at commercial interest for projects which do not have a major impact on the physical infrastructure.

Several witnesses stressed the importance of making a wide range of contraceptives available to meet already existing demand. Dr. Stephen Sinding of AID acknowledged during the question period that evidence points to greatest success in family planning programs when the broadest array of choices among contraceptive methods are made available.

Chairman Scheuer noted at several points the unwillingness of African governments to apply for loans for family planning programs. He linked this to the importance of other assistance/grant programs and also to the need for policies that would encourage these countries to make such loan applications.

Summary of Recommendations

Recommendations offered by witnesses ranged from very specific suggestions about funding for particular programs, to broad suggestions about the need to change the social and cultural framework of family planning programs. The recommendations offered on October 17 are summarized below:

—Greater support for family planning programs, both multilateral and bilateral was a persistent recommendation. Reversal of recent U.S. cutbacks in aid to such programs was urged by most, and some recommended large increases in specific amounts. Dr. Speidel specified a U.S. goal of providing $50 million annually to UNFPA and $50 million for bilateral population assistance.

—Most witnesses agreed on the need to improve the status of women. While most family planning programs focus on women, there is a need to broaden the concern for women's over-all status in order to achieve

wider interest in limiting family size. A need for better education for women, improved maternal and child health and improved economic prospects were among the recommendations.

--Greater focus on education and family planning programs for men was urged by Werner Fornos and Nancy Harris. They noted that men have been neglected by most population education programs. But because men are key decisionmakers, this made such programs less effective than they might be.

—Use of community-based organizations for planning and implementation of family planning programs was urged by several, including Nancy Harris and Mrs. Ofosu-Amaah. These would take advantage of programs already in existence such as village councils, women's organizations, churches, and missions. Mrs. Ofosu-Amaah in particular suggested that family planning should not be exclusively linked to the health system, since that system reached only a small proportion of the population.

—Encouraging private sector outlets for dissemination of information and contraceptives was urged especially by Mrs. Harris, who cited successful models in factories, and urged use of commercial distribution networks.

—Placing family planning programs in the appropriate social and cultural context was urged by several witnesses. The importance of understanding the cultural and social dynamics that produce a desire for large families was seen as a critical precursor of successful family planning efforts.

--Dr. Sheldon Segal specified the need to assist the development of indigenous scientific leaders, including social scientists. This would contribute not only to better understanding of the cultural context, but would build the most effective kind of African leadership.

—A translation of policy formulation into an emphasis on program implementation was urged. In those countries where population programs are a matter of policy, better program implementation should follow.

—Greater promotion of population programs by the World Bank was urged, in view of its influence on country policies and its ability to lend at concessional rates for desirable social goals.

IV. Natural Resource Management and the Environment*

The deterioration of the environment in drought-prone areas in Africa throughout the hearings was a recurrent theme. The term 'environment' was interchangeable in most testimony with natural resources, including forests, soils, water resources, and the basic ecological support systems for food, fodder and fuel production. There was considerable testimony from a variety of witnesses on the interconnections between environment, agriculture, and the various factors that had impacts on natural resources, including political and economic management systems, traditional practices, and cultural systems. Witnesses also commented at length on specific resource management problems and recommendations. These are summarized in this chapter. It should be noted that in some cases, there is overlap between this section and the summary of agriculture-related testimony. This is because so many witnesses saw interconnections between agricultural production problems and environmental deterioration.

Interconnections: Complex Causes and Effects of Natural Resource Deterioration

Many of the witnesses connected natural resource deterioration to a wide range of problems, from falling agricultural productivity to international debt issues. Environmental degradation was seen as both a cause of other problems and the result of policies related to these other issues.

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*Prepared by Susan R. Abbasi, Specialist, Environment and Natural Resources Division, Congressional Research Service.

In his opening statement on October 23, Congressman Tim Valentine, presiding, stated the close connection between the food crisis and environmental deterioration:

> While Africa's food crisis is not usually thought of as an environmental problem, a growing body of evidence suggests that widespread erosion, deforestation and desertification are but visible signs of a severely stressed ecosystem, one that is primed for dramatic failure during periods of reduced rainfall. Restoring the resilience and fertility of Africa's soils and forests may be the first and most signficant step that we can take toward helping Africa develop a sustainable food production system.

Lester Brown described the connections among forest, soil and water resources in the ecological cycle, and how a decline in one area soon has negative impacts on the other resources:

> We are also beginning to understand better the process of ecological decline and exactly what is involved. The process seems to begin with an excessive loss of tree cover....as the tree cover is lost, you interrupt the nutrient cycling that the trees provide; then when wood becomes scarce, you start burning cow dung and you start burning crop residues, as has been happening in Ethiopia now for a number of years, and you interrupt two more nutrient cycles. Then organic matter begins to decline, the capacity of the soil to resist erosion crosses the threshold of the rate at which new soil is formed. In the final stage, the hydrological cycle is affected and the amount of rainfall that runs off increases, the amount that is retained decreases, and this leads both to a reduction in aquifer recharge of underground water supplies and reduction in evaporation to recharge clouds.

As a result of this "domino" effect of resource deterioration, Brown concluded that an appropriate development strategy for Africa must restore the resource base on which the economy depends. The approach must be interconnected, one that restores tree cover, conserves soil, and restores grasslands and the hydrological cycle.

Agricultural development and environmental rehabilitation are "one and the same," according to Peter Freeman:

> ...the techniques of environmental regeneration, land regeneration, in Africa are, by and large, the same techniques used to intensify food production. They are not mutually exclusive. Therefore, I think that agriculture production projects can be, at one and the same time, environmental regeneration projects. We can think of these things as being one and the same thing.

Both Lester Brown and Mr. James Gustave Speth saw links between natural resource deterioration and the debt crisis in Africa. While Brown saw environmental degradation reducing production and requiring more imports, Speth saw debt problems putting additional pressure on the resource base, and reducing food crop production in favor of cash crops:

> Let's look at what countries do to try to meet the debt crisis. They increase exports. This means more cash crops, more forestry exports—things of this type. They try to decrease imports. That means they don't import as much oil, so they use more of their natural resources to produce energy. They adopt austerity measures. The austerity measures reduce incomes and increases unemployment, forces people back to the land. They also cut back on their new environmental and resource management agencies that have just been put in place.

The connection among policy, population growth, climate and patterns of resource use was stated by several witnesses. Mr. Speth stated:

> Land degradation, soil erosion, and water depletion have been the result of extreme climatic events, overuse of resources, ill-suited development policies, and high population growth. All of these have combined to threaten future prospects for food production. We must consider long-term actions and investments now to reverse these recent trends. Unless we act now, I can assure you that this country (U.S.) will be called upon to pay a much higher price later.

Lloyd Timberlake, author of Africa in Crisis, stated the complexity of connections between environmental deterioration and its causes:

> We found the relations between the present crisis and the environment very complex. The policies of investing too little in agriculture meant investing too little in the agricultural environment: in the soil and water regimes. Farmers, unable to make profits from agriculture, are lured into cities... There was neither the incentive nor the labor left in the countryside to invest in the laborious jobs of terracing or tree planting. Left alone in the countryside, peasants—a great many of them women—have been forced to take too much from their environment, putting too little back. Environmental resource accounts have been overdrawn.... "Desertification," that process by which good land is converted to wasteland due to overuse and misuse, is not only accelerating in the rainfed croplands and woodlands of the Sahel, but in the rangelands, croplands and woodlands south of that famine belt. Crop yields have declined over the past 20 years, in per capita terms, and in many areas in real terms.
>
> Thus while in one sense environmental degradation is a cause of Africa's crisis, in another very real sense, it is a symptom of the mismanagement and misplaced priorities that are the real cause of the crisis.
>
> ...If environmental degradation is a symptom of mismanagement, then projects and technology to resuscitate that environment will not work unless that mismanagement is converted into effective management.

Water Resource Management Problems and Needs

Several witnesses stressed increasing both the supply and more efficient use of scarce water through better management techniques, as well as through development and use of drought-resistant varieties of crops.

Dr. Irwin-Williams described the arid and inherently unstable climate of the drought-stricken areas of Africa, which are subjected to periodic drought, where water scarcity limits human productivity, and where inappropriate production efforts may cause permanent desert-like conditions:

> Arid or semi-arid ecosystems are intrinsically fragile and have low support capacity. The agricultural and pastoral techniques presently in use are generally relatively inefficient and in some areas land use practices are

> actively destructive. These factors have been compounded by historical and political events and have been aggravated by recent severe droughts. The cumulative result has been the rapid desertification.... of huge areas of the Sahel, amounting to the loss of more than 10 million acres to the desert in the last 40 or 50 years.... Of all of the basic needs and pressing problems faced by the peoples of Sahelian Africa, none is more crucial than the need for improved water supplies.

She went on to explain techniques of water harvesting, which several other witnesses also advocated. These include use of simple techniques such as the digging of catchment basins to collect rainwater run-off, changing slopes in some cases, building channels, and other methods of capturing rainwater and storing it for use on crops and in the home.

Similar efforts in Israel and Australia, Dr. Irwin-Williams reported, have been very successful, and that even in rain-poor areas, although rainfall is low and infrequent, a considerable total amount of water is produced. "Even one-tenth of an inch--that's 2.5 millimeters of rain--of a rain shower can produce one to two thousand gallons of water per acre if efficiently managed and harvested."

The use of otherwise unsuitable water, such as the salty or brackish groundwater that prevails in many parts of Africa, for salt-tolerant crops was a technique advocated by Dr. Aronson. He described how farmers in Israel had learned to use brackish water to irrigate, and noted that some 1,750 species will tolerate such water. Depending on the conditions in an area, he urged rainwater harvesting, or development of salt-tolerant food crops where such water is available.

Dr. Irwin-Williams mentioned the water harvesting research available in the U.S. at the Desert Research Institute with Clark University, and

and noted the appropriateness of the relatively simple, low technology methods to both the environment and the cultures of people in arid Africa.

Lester Brown emphasized that not only increasing water supply but also practices that are water efficient are important--both agricultural practices and development of drought-tolerant crops.

Soil Problems: Desertification and Erosion

Many witnesses stressed the fragile nature of soils in many areas of Africa. The inherent infertility of such soils makes them extremely vulnerable to desertification when vegetation is overused or destroyed and erosion occurs.

The impact of people and livestock on such fragile soils was exacerbated by the long drought, several witnesses noted. Mr. Speth stated:

> An arid and fragile ecosystem exploited beyond its carrying capacity eventually breaks down, and whether in the U.S. dustbowl or Africa, the results are tragic....Figures for soil erosion as high as 450 tons per hectare per year are not unusual, and in Ethiopia's highlands, one billion tons of valuable soil are being stripped by erosion every year. One billion tons. In all, about 7 million square miles are threatened by desertification in sub-Saharan Africa, and 16 percent of Africa's rainfed cropland will be lost by the end of this century if conservation efforts are not taken now.

Thomas Stoel of the Natural Resources Defense Council, noted,

> Perhaps the most troublesome trend—and one closely related to the famine is the loss of soil productivity. Precise figures for the African continent are hard to come by, but it is known that little arable land remains uncultivated; that on sloping fields, soil erosion of 20-40 tons per acre is common....

Lester Brown connected the "excessive loss of topsoil" to agricultural practices used today, and noted that some 17 nations now have lower crop yields than they did a generation ago.

Dr. Brady and Mr. Edelman of U.S. Agency for International Development (AID) noted that progress had been made in some areas. Mr. Edelman emphasized the attention being given to desertification by the President of Senegal, adding that it is crucial that African leaders themselves see the need to address these issues and take steps to find solutions. Loret Ruppe, Director of the Peace Corps, cited small-scale village-level efforts led by Peace Corps volunteers to stop erosion with rock walls and catchments as successful contributions to stopping desertification.

Methods of agricultural production which can reduce erosion were deemed very important by several witnesses. These included alley cropping, which alternates different crops that mature at different times, and conservation tillage methods, which by minimizing plowing, avoid clearing the soil of vegetation that protects it from wind and water erosion.

Living Resources: Trees and Crops

Closely connected to the prevention of soil erosion, optimizing soil fertility, and coping with arid conditions in sub-Saharan Africa are the importance of trees and forestry. Existing trees are under heavy pressure for use as firewood. Also, the loss of tree cover and other vegetation which need the nutrient cycle provided by trees, leads to loss of soil fertility and erosion.

The role of trees and the importance of agroforestry—mixing of trees and farming—was stressed by John Michael Kramer of CARE, who oversees that agency's forestry programs:

> Agroforestry in Africa today is an appropriate technology. It is a technology that has been practiced for hundreds of years, and that is underway today in fairly significant size. It is a proven technology. By agroforestry we mean the combination of trees, annual crops and/or animals on a given piece of land.

> Why agroforestry, you may ask. One reason is that for every tree planted in Africa today there are 29 trees that are cut. According to FAO, every drought-affected country in Africa is suffering from moderate to severe fuelwood shortages. But more than that, trees rehabilitate soils for agriculture. They provide fodder for animals, medicine for sick children, tools for workers, and so on.

In his written statement, Mr. Kramer described how the daily activities of the African subsistence farmer, combined with pressures of population growth and deforestation, reinforce the cycle of resource degradation that makes the farmer's life ever more difficult.

Dr. Aronson stated the importance of concentrating on needs of Africans beyond simply food, and stressed the role of trees and fuelwood in this complex of needs, in part because many foods cannot be eaten until they are cooked:

> ...in a large section of the Sahel in Western Africa, a World Bank-sponsored report published by Jean Grosse recently showed that the limiting factor to carrying capacity of well-fed and content humans in a large ecological zone of West Africa is in fact the shortage of firewood, more so than the shortage of food. We need to think in terms of agricultural systems that can supply sustainable supplies of food, fuelwood, and fodder if we want to approach any long-term solutions.

Perdita Huston, in her testimony on problems of women farmers, quoted village women who stated that water was not their biggest problem: fuelwood was. "We always know where to find the water. It may be far away... but that is not our biggest problem. It is the fuel. When we leave in the morning to search for fuel, we never know when we are coming back."

Dr. Kamasukiri of Africa Tomorrow noted the connection between loss of vegetation and advancing desertification, and included among the causes overgrazing of grasslands, commercial logging, and clearing for agriculture.

> In the northern Sahel, pastures totally disappeared, standing water was depleted and there was a widespread loss of scattered trees and scrub which had once served to stabilize the arid ecosystems.

> In its report of 1977 the United Nations estimated that about 650,000 square kilometers of once productive and ecologically balanced land along the southern border of the Sahel had become desert. In the coastal regions of West Africa, the most forests were being cleared by conventional loggers and subsistence farmers at the rate of five percent per year. This dramatic destruction then that has caused a disaster today is the one for which we need to suggest some approaches...

Addressing appropriate crop systems that can diminish soil degradation, Dr. Aronson urged greater attention in agriculture to indigenous plants that are already adapted to the harsh local climate and nutrient recycling demanded by the often poor African soils.

> There are numerous plants found in the tropics, the dry tropics and the wet tropics, that could be very significant new crops for people in the third world, and it is my belief that greater attention needs to be given to these wild plant resources. ....much greater attention should be given to the possibilities of developing new crops from wild plants genetically adapted to dry tropical conditions.

Lloyd Timberlake was among the witnesses who testified on the role of livestock in environmental deterioration. Several witnesses blamed the proliferation of cattle in arid regions as a cause of desertification. Mr. Timberlake emphasized the need to better manage goats and linked the solution to the inclusion of women in training programs. He noted a program in Kenya...

> ...whereby people are being taught how to manage their goats better. This is very important because the people there are too poor to have cows, and goats can be very detrimental to the environment. They tend to eat everything growing--young trees, etc. The word goes round that there is a training course in how to manage goats. People who show up are men. But back home it's the women who are managing the goats. ....we've got to somehow make sure that the women are involved in the training and education...

Resource Management: New Approaches Built on Traditional Systems

Most witnesses stressed the need for new approaches to increase productivity while adapting agriculture to the harsh conditions of Africa. At the same time, many of these witnesses emphasized that aspects of traditional African agriculture were well-adapted to these conditions, and that research would be most effective if it built on and improved traditional approaches. In many cases, several witnesses pointed out, economic development specialists had urged the abandonment of traditional systems in favor of modern systems or crops brought from other regions of the world, which all too often failed immediately, or failed to last more than a few seasons.

Many of the witnesses urged continuation and refinement of traditional systems of mixed cropping. Lloyd Timberlake stated:

> Some African societies have long practiced mixed cropping—sowing several crops in one stand--again to cut risks, increase overall yield per acre and discourage pests. Northern science has only recently—after trying for decades to discourage it--validated this approach and is seeking ways of improving it. "Alley cropping" is one neat variation, in which the main crop is planted in alleys between rows of leguminous trees or shrubs whose leaves are periodically slashed to supply nutrients to the soil. It is a soil management technique which can sustain crop production where farmers cannot afford fertilizer, and it is not radically different from many traditional systems.

Dr. Nyle Brady of AID described the slash and burn system of many traditional farmers. Slash and burn was a sustainable method that Africans had used for centuries, maintaining soil fertility by rotating their use of areas and allowing fallow seasons. However, pressure exerted by population growth caused farmers to shorten fallow periods. The system then became less stable and the soil deteriorated. Dr. Brady also described the intention of AID to use traditional methods. He noted the inclusion of alley cropping in AID

plans for assistance to African agriculture. He also called attention to the international research centers for agriculture, organized in different ecological zones, which will be able to focus on technologies appropriate to each zone's conditions.

The advantages of local adaptations made by traditional systems were also noted by Mr. Speth:

> Indigenous African cultures long ago developed production systems which were well adapted to the limits imposed by the fragile and arid conditions in Africa. Many new development schemes, on the other hand, have not fit into production systems based on local rainfall and soil types. And as a result these new programs have been less productive than traditional systems. As a consequence of these schemes, as indicated in a recent World Bank study, some success has been achieved, but the overall results have been more destructive than constructive. Traditional systems, of course, have their own limits. In recent years, those limits have been exceeded due to rapid human and animal growth; by changing social, political, and economic policies and by inappropriate Western-style development schemes.

Citing "long-neglected but potentially effective methods of soil fertilization" of traditional African agroforestry practice, Dr. Kamasukiri argued for synthesis of indigenous methods and research discoveries that would build on them and be adapted to Africa's wide variations in soil and climate conditions:

> Fundamental to Africa's long-term development strategy are the needs for soil fertility improvement, land and water management and crop improvement. Insofar as Africa possesses enormous biophysical and climatological as well as crop variations, it is recommended that the most appropriate technologies are those which reflect a complementary synthesis of indigenous innovations and those developed elsewhere.

Also noting the wide variations of conditions in Africa, Dr. Aronson indicated the need to learn from, as well as to teach Africans, and to think in terms of transferring technologies between regions within Africa:

> ...if we are working in third world countries and attempting to transfer technologies or teach or train, what have you, we should go in with open minds and be alive to the fact that we might be able to learn much more than we are teaching in some of these areas. And our transfer attempts might be more a case of transferring something effective that the Somalis have developed, for example, to West Africa rather than always trying to transfer from Cornell and U.C. Davis to Somalia and West Africa.

Much discussion focused on the needs of small farmers and the need to provide small-scale assistance at the village level. Thomas Stoel cited the Office of Technology Assessment report of 1984, "Africa Tomorrow," and quoted its conclusions that "the technology most needed in sub-Saharan Africa should be low-risk, resource-conserving, small scale, affordable (not capital intensive), locally produced and repairable, adapted to local labor availability, and consistent with traditional agricultural methods." Mr. Stoel pointed out the multiplicity of actions that are involved in projects to restore the resource base, and went on to say:

> Common sense tells us, and experience confirms, that these local projects can only succeed when local people are involved at all stages of project identification, design, and management, and come to feel that the projects belong to them. The object of these projects must be to benefit local people by increasing the productivity of the resource base, and the people must be convinced that they will benefit.

Mr. Stoel also advocated use of local organizations, such as village councils, and/or private voluntary organizations working at the local level, including wherever possible the indigenous nongovernmental organizations.

Several witnesses, on this point, argued that the typical approach of large development institutions such as U.S. AID or the World Bank were too focused on capital-intensive, large-scale projects that harm the environment if not very carefully planned: They urged instead approaches like that of the Peace Corps.

Loret Ruppe, Peace Corps director, stressed the need for coordination and cooperation--and long-term commitment among all those offering assistance and stated the strength of the Peace Corps volunteer program in dealing with grass-roots needs.

> The Peace Corps knows there are no easy solutions, but it has always believed that the solutions must lie in long-term grass roots programs. ...Coordination between U.S. and international aid donors is critical. We must make the most of all available resources. Peace Corps volunteers have long coordinated with private voluntary agencies in the field, and new collaborative arrangements with the PVOs, U.S. AID, USDA, the Forest Service and other agencies are bringing us closer to the day when worldwide hunger is eradicated.

Lester Brown cited the need to rebuild a continent as a result of ecological devastation, and drew a parallel with the Marshall Plan in Europe after World War II; he also noted the absence of many kinds of needed institutions for a large-scale effort. While acknowledging the importance of the international development community, he drew back to essential grass-roots components:

> The things that hold the key to reversing the decline in Africa are basic grassroots things like planting trees, planning families, building conservation terraces--things that are people intensive and not capital intensive. That is not to say that Africa will not need far more capital in the future, but it is not the traditional sort of World Bank approach of throwing a hundred million dollars at the project here and three hundred million there. Rather it is organizing people to plant trees and plan families on a scale and with an urgency that has not been undertaken anywhere before.

The difficulties of reaching rural farmers across vast areas of Africa was acknowledged by most witnesses, yet several reported success stories in many specific areas. The emphasis on reaching village level activities

with grassroots projects and programs was strong, as was the need for extensive research on problems that are unique to Africa. The fact that traditional systems contain adaptations which should be acknowledged and built upon did not lessen the need for sophisticated research, most witnesses agreed. Optimal research was characterized as combining the best of traditional wisdom with better, more productive strains of tree and crop species--keeping in mind the need to conserve the basic resource base comprised of the soil, water and necessary nutrients.

Summary of Recommendations

Some of the major recommendations on natural resources management that emerged in the hearings are summarized below:

—Development efforts should have a strong emphasis on resource rehabilitation—something that is lacking at every level currently.

—Agricultural development is critical to the economic well-being of African people, and must be done in ways that do not cause deterioration of the basic soil and water resources; environmental constraints must be recognized and accomodated by agricultural systems if these systems are to be sustainable.

--Local, indigenous plants and food crops are often best adapted to the rigors of African climate and environment. Instead of focusing on improving plant stocks from temperate zones, agricultural development should build on these plants which can tolerate local conditions.

—Given the difficult climate and the fact that traditional systems have been stressed by population growth, there is a great need for research and development--especially research that will take advantage of traditional adaptations and build on them to increase agricultural productivity in harmony with the environment.

—Technology transfer is essential, but should focus on low-cost, simple methods that can be employed without extensive training or continuing maintenance costs.

--Some of the best technology transfers might be between or among the regions of Africa that share certain climate conditions, rather than importing technologies from other areas of the world.

--Solutions to local problems should be sought for locally identified problems that matter to people on the ground. "Bottom up" approaches must be emphasized.

--A long-term strategy for environmentally sound agricultural development is needed; short-term plans overlook problems that emerge only after many years. Such a strategy must integrate the economic, social and political factors in a community with development of agriculture and sound natural resource management.

--The roles of private voluntary organizations should be strengthened, since they are in a good position to emphasize the small-scale village level actions needed and to do "bottom up" development. This should stress where possible the indigenous non-governmental groups.

—Support from host governments for these strategies is essential, and should be sought.

—Because so much of the agricultural work and harvesting of fuelwood and collection of water is done by women, solutions to these problems should involve women to a much greater degree. Training programs on environmental problems must involve women.

—A long list of specific recommendations including some of those listed above was provided in the written testimony of Thomas Stoel.

V. Food and Agriculture *

Dimensions of African Food Problems

During two days of hearings, the Subcommittee explored the dimensions of African food and agricultural problems: the causes of both short run and long run food supply problems; broad options for increasing food production; some specific technologies for increasing food output at the household or village level; and the roles of governments and other organizations in promoting the development of agriculture and improving food supply.

At the outset of these hearings, Chairman Scheuer distinguished between the drought as a cause of the recent food problems in Africa and more fundamental problems such as the rapid rate of population growth in the region, mismanagement of natural resources, and environmental deterioration. The issues raised in the hearings with respect to population and natural resources and the environment are summarized in other sections of this report. This section focuses more particularly on problems of food and agriculture, albeit in a context of a rapidly growing population that is putting severe pressures on the natural environment and production systems.

Droughts have occurred in Africa throughout the region's history, yet the consequences of recent droughts have been more severe because of over-exploitation and mismanagement of the continent's natural resources which, in contrast to the natural resources of temperate zones, are fragile and easily damaged without careful management. Traditional African agricultural

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*Prepared by Charles E. Hanrahan, Specialist in Agricultural Policy, Environment and Natural Resources Policy Division, Congressional Research Service.

production systems were well adapted to the rainfall regimes and natural resource endowment. These systems maintained their productivity by interspersing long fallow periods (10 years or more) with relatively short periods during which the land was cultivated (2 to 3 years). Sparse populations could be accommodated by such systems. Traditional nomadic livestock herding was also adaptated to the African environment, making good use of limited grazing lands and water.

The growth of human and animal populations in many parts of Africa has resulted in the widespread breakdown of traditional agricultural and livestock production systems. The nature of some of the underlying causes of African food problems and their relationship to recent droughts was stressed by Mr. James Gustavus Speth in his statement to the Subcommittee:

> Many factors are responsible for Africa's falling food production. The drought is only partly to blame. Droughts have occurred regularly in sub-Saharan Africa for the last 2,500 years. The effects of the current drought have been made much worse by overexploitation and mismanagement of the continent's fragile resource base. Growing human and livestock populations and inappropriate development policies have degraded forest, soil and water resources and magnified the drought's destruction.

In addition to over-exploitation of croplands and overgrazing of rangelands Mr. Speth pointed to increased exploitation of forests and woodlands for fuelwood and charcoal production as a major cause of devegetation and degradation of soils and watersheds.

Another major source of long-term food difficulties in Africa, as Dr. Nyle Brady, Senior Assistant Administrator, Science and Technology Bureau, Agency for International Development, emphasized, has been the failure to develop technologies and farming systems that are specifically adapted to circumstances unique to Africa. Dr. Brady pointed to both technological

stagnation and failure to develop technologies appropriate to African agriculture, as major causes for short-term and long-term food problems. Africa, he noted, lacks the institutions and capacity to carry out research and develop the appropriate technologies. Mr. Speth espoused the view that emphasis on the production of cash crops at the expense of food crops has increased land degradation as well as reduced food production. Farmers are forced off good land, which is allocated to cash crops, on to marginal lands more subject to erosion. AID witnesses were careful to note that AID funds are not used to finance the production of cash crops. In his testimony, for example, Dr. Brady stressed that all the money spent by AID in support of the international agricultural research centers went to support research on food--not cash--crops.

Failure by many African governments to establish policies that provide incentives to African farmers, or to invest in agriculture and rural areas was also cited by many of the witnesses as a root cause of Africa's food difficulties. These policies have also had deleterious effects on the natural environment in Africa. As Lloyd Timberlake of Earthscan put it:

> The African crisis is largely a result of policies in which African nations tried to develop their cities at the expense of the countryside, at the expense of the 80 percent of the population which tried to get a living off the land. Now this has caused an environmental crisis in two senses. One, these policies have caused the environment to be hammered. They have tended to overuse a fragile environment, to take the trees off, to overgraze, over-cultivate, and this has led to what we refer to as environmental bankruptcy. It simply means an environment which has been so overdrawn that it can give no more and something else is going to have to be put back in. This leads to the second way in which this is an environmental crisis. For Africa to get out of its spiral of moving apparently ever more rapidly from one crisis to another, we're going to have to figure out ways of getting aid and technology into the environment to balance the accounts. And this is going to be extremely difficult.

Options for Solving Africa's Food Problems

Transfer of Appropriate Technology

Transfer of appropriate technologies to African countries emerged as a major option for contributing to increased food production. Citing a report of a panel established by the Environmental and Energy Study Institute which he chaired, Mr. Speth said:

> In addressing strategies for future increased food production in Sub-Saharan Africa, we believe that the highest priority must be given to methods, technologies and practices that would contribute to increased production of food from traditional farming systems. We believe that such emphasis would best help the resource poor and neglected rural areas where help is so desperately needed. By increasing productivity of food crops on existing good lands, the pressure to farm more marginal lands could be reduced.

In addition, Mr. Speth stated:

> I think there are an array of emerging technologies that can make a tremendous contribution to solving these world-scale problems. Technologies in energy, in pollution control, in biotechnology, in computers. There is no reason the Third World has to go through the cycles of pollution and environmental degradation that we went through with industrialization. And hopefully, if we tend enough to these problems, there can be some leapfrogging in the Third World into some of these technologies.

Among the technologies which already exist and need application on a broader scale are schemes for grazing management, small-scale irrigation, village-level water harvesting, conservation tillage techniques, watershed rehabilitation, fuelwood development and agroforestry. These technologies could be transferred from the developed countries to Africa, but as Dr. Aronson indicated in subsequent testimony, there should also be the transfer of technologies between developing countries.

Commenting on the context in which transfer of appropriate technologies should be carried out, Dr. Ralph Smuckler in his prepared statement pointed out that the EESI recommendations not only stress the transfer of technology, but also,

> They stress training and other initiatives to build local self-sufficiency and a shift away from big, capital-intensive projects toward smaller scale projects which efficiently use energy, water and other resources and which are economically sustainable. They are generally a set of process-oriented actions designed to build capacity and manpower within developing countries to enable them to make the difficult choices necessary to adequately manage their environment toward attaining sustained development. Together, the recommendations propose a new, more cost-effective, localized approach to development.

Building Agricultural Research and Education Capacity

A second major option for helping African countries increase food production was increasing agricultural research and education capacity, so that African countries could conduct research and develop or adapt the technologies appropriate to their particular circumstances.

Dr. Brady testified extensively about this approach to developing African agriculture and increasing food production. He pointed to the successful experiences around the world in agricultural research and technology, development of the international agricultural research centers, as well as national agricultural research and educational institutions in Asian and Latin American countries as a model for Africa. Technological advances, especially from the international agricultural research centers, underlie the "reasonable" successes in Asia and Latin America, where food production is keeping pace, and in some cases even exceeding, population growth. In contrast, Africa's population growth is outpacing the growth in food production, thus per capita food production has been declining.

Dr. Brady described the process followed in Asia and its relevance for the development of agricultural technologies appropriate to Africa as follows:

> ...I would argue that the same principles that were followed in Asia must be followed in Africa if we are going to provide them the technologies that will pay off. In some cases, we have made the same mistakes that were made in Asia in the 1950s and 1960s. We have assumed that all we had to do was to take some technology developed elsewhere, give it to the Africans, and say 'thou shalt develop' and it didn't work.
>
> ...We had to develop technologies that fit the Asian scene. We developed rices, we developed wheats, we developed maizes, we developed technologies to make use of those new varieties, and it has paid off. Literally billions of dollars of extra food are being produced as a result of these efforts.
>
> We think the same kinds of principles ought to be used in Africa and are beginnning to be used. And already, coming out of the international system, the International Agricultural Research Centers, as well as U.S. universities and their counterparts in these countries, we are beginning to see the kinds of things that came out of the system in Asia.
>
> Even though the numbers are not great yet, there are improved varieties of cowpeas, one sorghum, a hybrid sorghum, that is world famous for its resistance to drought--only one variety, and we have got to have dozens of them before this works.

To a large extent, conducting research and developing technologies for African agriculture would depend on having educated people who can carry out the experiments and do the work needed to develop or adapt the technologies. Dr. Brady addressed this issue by alluding to the experience of the United States in helping India develop agricultural universities, patterned on the U.S. land grant university, in which students from India were educated in the agricultural sciences to the masters or Ph.D. level, instead of going to universities in the United States or elsewhere. Dr. Brady argued:

> ...Much of India's success in agriculture has come from the fact that they have this quality series of universities. The Africa Bureau of AID has developed a basic game plan that says, let's

look ahead 15 years and see what we want to try to help Africa develop. One of the things that we are doing is developing a plan to try to help these selected universities, not in 45 countries, but in six or eight locations, perhaps, help them develop over a period of time quality institutions so they can train their own people and provide the expertise that they need.

The emphasis that AID is planning for agricultural research and education in Africa, and the fact that it would be concentrated in a limited number of African countries, raised the issue about what other countries in Africa could do to enhance their agricultural research and development capacity. Dr. Brady responded that it would not be financially possible to build first class research and education institutions in each of 45 African countries. Alluding to the experience of the United States, Dr. Brady indicated that the six or eight centers in Africa could become regional centers of excellence serving the needs and interests of countries in surrounding, ecologically similar regions.

Mrs. Schneider inquired as to the role that women would play in AID's strategy of building research and education capacity. Dr. Brady pointed out that it is AID's policy to incorporate women into its development assistance activities, that in some of the international research centers the majority of trainees and program participants were in fact women, but that in Africa AID policy often faced obstacles posed by a male-dominated society. (See Section VI for more detail on women in development.)

Other issues surfaced during the discussion of AID's research and education strategy: the role that Israel might play in research and development of new technologies in Africa; the extent to which funds allocated for research would be spent in the United States and not in Africa; and the extent to which AID agricultural research was coordinated

with research by the Department of Agriculture. Dr. Brady responded that Israel indeed had much to contribute to African agricultural development, but informal, rather than formal, legislatively mandated approaches were to be preferred. Dr. Brady indicated further that 95 percent of AID's research money was spent in Africa, although that included funding for the work of U.S. university staff members in African countries. Regarding AID and U.S. Department of Agriculture coordination, Dr. Brady stressed the closeness and mutually beneficial nature of the relationship between the two agencies.

Mark Edelman, Assistant Administrator of the Africa Bureau of AID also testified on AID's approach to improving food production in Africa. He stressed, as had Dr. Brady, the need for a responsive research system that addresses the specific technological constraints of African farmers. Such technologies, he noted, would be location-specific and sensitive to ecological and socio-economic environments of the farmers who use them. In further detailing the AID research plan, Mr. Edelman said:

> In order to more effectively utilize AID resources to improve agricultural productivity, we have issued this year a plan for supporting agricultural research and faculties of agriculture in Africa. It establishes priorities for research on six major food crops, directs support for basic research to eight countries with more advanced research capacity while strengthening others in agricultural technology adoption, fosters commodity research networks and sets the basis for support to African faculties of agriculture.

Congressman Benjamin Gilman expressed concern that AID's agricultural research plan omitted or neglected underlying environmental problems. In particular he questioned the extent to which the research and education plan would deal with problems of desertification, deforestation, soil

erosion and the need to combat these environmentally damaging factors with reforestation, soil conservation and other environmentally sound practices. Mr. Edelman responded that while these matters were not directly addressed in the report, the research strategy interfaces with environmental concerns. Moreover, the research strategy constitutes only one component of a broader more complex strategy that would address all of the problems related to Africa.

The two broad themes--transferring technology and building agricultural research and development capacity in Africa are not mutually exclusive. The prepared statement of Dr. Smuckler, who is both dean of international programs at Michigan State University and a member of the EESI panel chaired by Gus Speth, was directed toward an effort to integrate the two themes. Dr. Smuckler noted:

> The transfer of R & D capacity has been identified by many as an extremely cost-effective and necessary approach for sound environmental management in the developing world. African countries must have the capacity to judge, adapt, develop and use new technology appropriate to their needs.

In summing up his testimony about the importance of transferring technology and building African institutional capacity, Dr. Smuckler concluded:

> To sum up, I have urged a long-term commitment, a 15 -20 year perspective, for addressing the food problems in Africa. Such an approach would include attention to agricultural and technological manpower needs, strengthening institutions to train advanced manpower in these fields, and concerted attention to strengthening agricultural research through building up R & D capacity. Such moves should be accompanied by parallel and sustained efforts in environmentally related fields so that agricultural improvement can be sustained over the long-run in the African setting.

Some Specific Technological Options

Several witnesses presented for the Subcommittee's consideration some very specific technical approaches for dealing with Africa's food problems. Some of the technical options that concern particularly agricultural production, including fish farming, are discussed below.

Household Gardening

Household gardening is a specific technology that was recommended to the Subcommittee by Dr. Albert Meisel, Executive Director of the League for International Food Education. According to Dr. Meisel, household gardening as a system for family food production has many positive benefits. Such gardens can contribute to improved family nutrition and health, and can make people more self-sufficient by increasing the physical availability of nutritious food and by increasing incomes from the sale of surplus garden products. However, according to Dr. Meisel, the benefits from household gardening are hard to quantify mainly because it is costly to study small and widespread projects. A sufficient number of such studies should be conducted in order to establish the positive effects that household gardens can have. Funding on the order of $2 to $3 million, is needed to enable private voluntary organizations and the Peace Corps to introduce household gardening in Africa. Some research may also be needed to make this kind of system appropriate for arid and semi-arid lands in Africa, since most of the experience with household gardening has been in the humid tropics.

Mrs. Ofosu Amaah called attention to the fact that in many areas there is a strong historical tradition of household gardening.

Using Indigenous Species

In contrast to the approaches that involve the transfer of crops or technology, or the development of new crops and technologies appropriate to African agriculture, Dr. James Aronson advocated promotion of the use of indigenous species to meet the food, fodder, and fuelwood requirements of Africans. As Dr. Aronson noted:

> There are numerous plants found in the tropics, the dry tropics and the wet tropics, that could be very significant new crops for people in the Third World, and it is my belief that greater attention needs to be given to these wild plant resources.

Since these plants are already genetically adapted to dry tropical conditions, the challenge according to Dr. Aronson, lies in developing their economic potential. With respect to the kind of research effort needed, Dr. Aronson said that in contrast to research and development in the temperate parts of the world where effort is directed to getting maximum yields from the farm, in the tropics greater priority should be given to research and development aimed at obtaining sustainability of yields.

Aquaculture

One option for enabling Africa to feed itself was advanced by the Africa Tomorrow coalition, a group of scientists and celebrities devoted to finding technologically appropriate solutions to African food problems. This technology involves the use of hand-dug ponds fertilized with local nutrient sources and stocked with tilapia, an indigenous African fish. The tilapia will feed off spirulina, a blue-green algae whose growth is promoted by fertilization. water. The advantages of this technology noted by these witnesses are the

tremendous output--one acre of fishpond can produce up to 7 tons of fish annually--plus the fact that the technology makes use of available resources and can use saline or brackish water. The proponents of fish farming in African villages do not look upon this technology as a panacea for African food problems, however, Dr. Paul Winchell, a member of the Africa Tomorrow coalition stated:

> We are all aware that one answer will not suffice to solve Africa's problems. Many creative approaches are needed to stem the devastation of starvation and malnutrition on a long-term basis....(v)illage level fish farms can adequately feed the people during the bleak periods while viable technologies restore Africa's long-term productivity and increase agricultural output....

An additional advantage of the technology recommended by the Africa Tomorrow coalition lies in the production of spirulina itself, a high quality protein substance--65 to 71 percent protein by weight. Only three ounces of spirulina can supply a total daily protein requirement for almost any normal person engaged in a moderate amount of physical activity. With the protein from spirulina, according to Dr. Heimlich, another member of the African Tomorrow Coalition, one could cure and prevent kwashiorkor, a protein deficiency condition, which is often complicated by blindness due to vitamin A deficiency, edema and opportunistic infections.

Roles of Governments and Other Organizations

The Subcommittee, in its consideration of resource, environmental and agricultural issues, paid particular attention to the role of the Peace Corps and the private voluntary organizations (PVOs) in assisting Africans to increase food production.

Loret Ruppe, Director of the Peace Corps, testified about the role of the Peace Corps in addressing Africa's food needs. She noted that

although many early volunteers worked in agriculture, irrigation systems, well digging, forestry and the like, the primary orientation had been on education in the classroom of the developing countries.

Today, according to Mrs. Ruppe, the Peace Corps emphasizes combatting hunger by improving agricultural production and fitting in to the overall development plans of the countries where volunteers work. Peace Corps volunteers use techniques adapted to particular constraints of rainfall, soil conditions, water availability and seed quality to work with villagers and transfer appropriate technology at the grassroots level. She cited a typical example from Burkina Faso, a country in the Sahelian region of West Africa:

> A 23-year-old volunteer from one of the Western states took me to his village and said: 'You know the villagers came to me a year or so ago and said, you know, could I bring them in bulldozers? Did I have earthmoving equipment? And I said well, no, I'm a Peace Corps Volunteer. But indeed 'if you are willing to really work on this I can show you a way.' He encouraged them to put low, 2- or 3-foot high rows of rocks across the floodplain, encouraged them to plant vegetation and trees, and indeed one year later the first rains had come and you could see that they had been held back by these rows of rocks and indeed vegetation was growing and that village was going to be saved from desertification.

In response to a querry by Congresswoman Schneider, Director Ruppe acknowledged difficulties in recruiting both staff and volunteers with the requisite expertise to work in the area of natural resource management, but indicated to the Subcommittee the efforts her agency was making to attract people qualified to carry out natural resource management and agricultural projects. Some of these efforts include targetting forestry school graduates for recruitment, recruiting retired foresters, and working with

private industry to either attract retired people with requisite skills and abilities, or to take people on loan.

Roles of African Governments

Critical to the success of any effort to increase food production on an environmentally sound basis is the cooperation and leadership of the African governments themselves. Chairman Scheuer dressed the importance of commitment on the part of the African governments, and rated that these governments seem to have become more committed in recent years to doing something about environmental, population and agricultural problems. Mr. Speth and Mr. Edelman were two witnesses who commented favorably on the positive attitudes of many but not all African leaders and they resolved to tackle these difficult, but not intractable problems.

Summary of Recommendations

Several broad themes and a number of specific suggestions for dealing with African food problems emerged during the hearings devoted to technologies for increasing food production. These themes and technical solutions for African food problems constitute in effect recommendations for action. Witnesses noted that there were still problems in countries where the governmental policies are not geared toward dealing with these issues.

Recommendations made during the hearings included the following:

--Promotion of programs and projects to address the environmental and natural resource problems of countries in Sub-Saharan Africa so as to increase agricultural productivity and reduce long-term food aid requirements. The emphasis in programs to redress environmental and

natural resource problems would be on the transfer of technologies that were appropriate to African ecological circumstances. Many of the specifics of this approach, recommended strongly by Mr. Speth, are elaborated on in the report of the Environmental and Energy Study Institute, A Congressional Agenda for Improved Resource and Environmental Management in the Third World, October, 1985, which is included in the record of the hearing.

—Building research and education capacity in agricultural and related sciences in African countries. This approach involves establishing six to eight universities and research centers in ecoogical regions in Africa. These institutions would develop the capacity to train scientists and carry out research and development of Technologies appropriate to African agriculture. Details on this research plan are included in AID's submission of materials for the record of the hearings.

—Support and fund projects to establish household gardening, especially in arid and semi-arid regions of Africa.

—Research and development of indigenous species to meet African food, fodder, and fuelwood needs. Special emphasis should be put on research to determine the economic potential of indigenous species and on securing stable yields under arid tropical conditions.

—Develop aquaculture projects in African villages for the production of fish (tilapia) and high quality protein (spirulina) to meet protein needs of Africans.

--Several specific technologies for which various witnesses urged support are listed and discussed in the portion of the hearing summary on natural resources and the environment. These include agro-forestry, water harvesting, small scale irrigation, soil and water conservation methods, etc.

VI. Women in Development/Role of Women*

The role that women play in contributing to development has been increasingly recognized in areas such as involvement in food and agricultural production, use of natural resources (water and fuel), options in family planning, education and training of women, and political or cultural participation. Yet, many observers also feel that women's roles have been neglected in political activity, and economic growth worldwide, especially in Africa.

On October 30, 1985, during the fourth day of hearings on hunger in Africa, a panel of witnesses concentrated on the issue of women's roles in African development, and actions needed to improve African women's lives, as well as augment their contribution to African development. Throughout the five days of hearings, the issue of women's roles in Africa was often raised, particularly with respect to discussions on population, agricultural technology, training and education, and use of natural resources. Unless otherwise noted, the following pages will concentrate primarily on the fourth day of hearings.

Overview: Women's Roles in African Agriculture and Development

The following points relating to women's roles were emphasized by the witnesses: In many parts of Africa, women produce nearly all the food for local consumption. In addition to agricultural duties, women are responsible for a multitude of other duties: fetching water,

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*Prepared by Susan B. Epstein, Analyst, Environment and Natural Resources Policy Division, Congressional Research Service.

finding fuel/firewood, providing family health services. Among African women who work outside the home, seven out of ten women work in agriculture, and yet earn little or no income from their employment.

While women are the primary producers of food, they are typically left out of education programs or efforts to transfer new technology that would improve production capabilities. Similarly, while women are the retrievers of fuel and water, advancements in these areas have often been viewed as unimportant, or improved technologies are not well-maintained after a locality has obtained equipment to make women's work more efficient. Furthermore, while women are the bearers and caretakers of, on the average, six to eight children per household, they are often excluded from family planning information or decisionmaking.

As Congresswoman Claudine Schneider stated in her opening statement on October 30th,

> I think the consequences of our failure to examine and enlist the full potential of women in the work force, particularly in tasks of African development, certainly could be serious, if not fatal, when we recognize that somewhere between 60 and 80 percent of all agriculture that is raised throughout the world is essentially produced by women. It is also tragic to recognize that less than one percent of all agricultural land happens to be owned by women.

Nearly all of the witnesses testifying on the issue of women in development cited examples of problems particular to women; there was little disagreement on the need for change in attitudes regarding women's roles in African Development. If any disagreement on women's roles occurred throughout the five hearings, it generally concerned how to set priorities in the numerous suggestions to achieve participation and augment contributions by women to their societies.

Involvement in Food and Agricultural Production

Witnesses and committee members often mentioned that while women produce most of the food, most of these developing countries' laws and practices prevent women's access to land ownership, education, training, or credit. Women carry out farming activities that do not get rewarded economically, and they are not able to participate in many major decisions regarding the use of land, resources, credit, or crops.

Dr. Christine Obbo pointed out generally, "We are going to need policies and programs that are going to consider African women as the traditional producers and purchasers of food."

She went on to point out the connection between the labor shortage in subsistence farming to the issue of women in development:

> The shortage of labor on the farms has something to do with women, that women are in fact overworked...if you are planning development projects, you don't ask women, who are already contributing 90 percent of the labor force to work a little more to improve development in these countries. Women are already the backbone, and we don't want to break the backbone; we want it to survive.

Elisa Smith further related women's issues to land ownership:

> The big issue regarding land is ownership...When ownership of land is given to women or they have more access to that, it opens up other opportunities for them--the opportunity to have credit, the opportunity to have technical training that is denied them because they are not perceived as land owners.

In addition to acquisition of land and better access to credit by African women, witnesses offered two other solutions for improved participation by women in the development of their countries' farm sectors: training and extension, provided specifically for women and taught by women; and improved technology that would be appropriate for relieving women's burdens, thereby increasing their productivity.

Training. Changes and increases in agricultural training and extension for African women were emphasized. The three witnesses agreed that more female trainers and extension agents are needed to educate African women in improved agricultural techniques. On this subject, Ms. Huston related an example that illustrated the training problem: male development workers attempting to train women how to use stoves, despite the fact they were not allowed into kitchens. Ms. Smith added:

> From all our experience in the field with women, there just are not enough extension agent systems out there reaching local women farmers... What we hear and what we see out in Africa comes back to say to us that there have to be actively recruited female extension agents.

Furthermore, she stated,

> Agents that work with women in the local level would need to be trained on how to differentiate the sex roles within the farming system and family so that there is a real understanding of how the training has to be shaped.

Dr. Obbo pointed out some areas in training that need to be overcome:

> The main reason why there is a problem with extension is that a lot of people do not speak the local language. If you go to the village and people do not have an education, are you going to use the measure on an American package of milk or fertilizer saying one cup, or are you going to translate it into a local thing meaning one gourd?

Another problem in training, as pointed out by Dr. Obbo, is that women not only need training in farming skills, but also need managerial and bookkeeping training. She related an example:

> "a grain mill in Tanzania that was started by a group of women in a cooperative. The only problem was that these women were illiterate and they didn't have any necessary skills to run a grain mill, such as bookkeeping and managerial skills. So they hired a man to do it, and the result was that the man cheated them out of their business."

Another problem to overcome in training women, is the inherent suspicion African women have toward the educated, particularly the educated women. Dr. Obbo described the situation of a woman who had lived in an area, left to earn a Ph. D. in agronomy at Cornell, and returned to teach. It took her three years to convince the villagers to trust her.

Dr. Obbo suggested that AID and other institutions should establish a requirement for recruiting at least 50 percent female trainers. Chairman Scheuer questioned whether African countries would look upon this as American imperialism, projecting American attitudes onto African cultures. Dr. Obbo responded that the developing countries would likely be grateful for the assistance in promoting development, and would not look upon it as American imperialism.

Improved Technology. Generally, the witnesses provided examples of instances in which technology was either developed with men in mind, or was not developed at all. The hearing on women in development presented the need for technology that would reduce the burden of effort and time involved in women's roles. Such technology would provide improved family food security, as well, witnesses suggested.

Dr. Obbo provided great detail in this area. In discussing different commodities grown in Africa, she stated that some are more nutritionally valuable than others. However, because corn, for example, is easier to grow and cut with the given technologies, the Africans eat more corn, even though it provides less nutrition than millet. With improved knives for cutting stalks of millet, women might grow, process, and cook more millet. She went on to discuss storage technology, saying that if families and

to save their locally-grown commodities rather than sell them all at once in the urban centers. Without adequate storage, food is sold during harvest time, when prices are low; families must buy food in the off-season, when food prices are high.

Also, better transportation and marketing facilities could enhance potential for women to earn incomes. With the ability to get crops to urban areas, a woman can sell her home-grown crops, making some revenue while providing better food to the urban populations.

Women's Role in Providing Fuel and Water

Closely related to women's agricultural responsibilities are the responsibilities African women assume in providing fuel and water for the household. The difficulty in finding adequate water and fuel supplies are only part of the problem; the fact that retrieving these resources for the household competes with agricultural and domestic duties for the woman's time is an added concern.

An anecdote related by Ms. Huston illustrates the issue:

> In talking with women at water points, the comment was heard over and over again from women, "Yes, it is very nice to have water now, to have these wells. But that is not our biggest problem. We always know where to find the water. It may be far away and take a long time to fetch. But that is not our biggest problem; it is the fuel. When we leave in the morning to search for fuel, we never know when we are coming back."

In attempting to implement solutions for relieving women of their burdens, some new technologies and equipment have been introduced in Africa; however, many times the "solutions" have consisted of inappropriate technologies or have not considered the local customs. To illustrate this point, Ms. Huston narrated another anecdote:

> As the Regional Director of the Peace Corps, I was visiting a country and was asked by the Director of Peace Corps in that country to talk with a fellow at USAID who had a multi-million-dollar wells project for that country and who had involved the Peace Corps and Peace Corps volunteers in training people to use the wells.
>
> However, it turned out that the wells were not being used. They had been placed too close to the magic tree or too near the ancestors' resting place, and most of the wells were not being used. Women were still going very far away to fetch their water.
>
> ...So my first suggestion is train ourselves. We need a new pair of spectacles to look at the world, look at who does the work, look at whose roles are for what, and then plan people-centered development programs.

Dr. Obbo told of the woman who returned to Africa, after receiving her Ph. D. in agronomy at the University of Cornell:

> The long and short of it was that she convinced [the villagers] that they should have a solar oven. Now, this sounds very simple, a solar thing built on cow dung and all of that. But it did change people's lives. People are spending less energy on doing unnecessary things.... You have a solar oven which brings men and women together, and people soon forget that they are supposed to have separations between the sexes.

Congresswoman Schneider, on this subject interjected a contrasting point which again illustrated the need to look at the specific customs of each community individually:

> I have heard tell of some instances where solar ovens have been introduced into developing nations as a failure in that most of the cooking and activity was taking place after the sun already set. So we need to be careful about how we promote that. If we were going to be using solar ovens for processing or for drying of foods to better suit them for storage, I think that is certainly an appropriate approach.

The consensus of opinion among the witnesses and Subcommittee was that African women must have time-saving, labor-saving technology to help with acquiring water and fuel; such technology must be appropriate for their

cultures. Furthermore, the introduction and maintenance of the technological equipment must be geared to the local people, particularly the women, since they are the users of it.

Family Planning Needs of African Women

Perdita Huston elaborated on some of the main aspects of family planning as it relates to women's roles and contributions to development in Africa:

> I think we have forgotten women in the development effort, and we have forgotten men in family planning... Because it is women who bear the children, one thinks that they are the ones who have to be convinced not to have as many. Believe you me, I have talked with hundreds of women all over the developing world, and they do not need to be convinced. Let us direct our population motivation programs to the husbands, who are the key to their having the choice to plan their families.

The points made in this hearing included issues related to desired family size (6 to 8 on average), women's wishes to be employed, and employment alternatives; all of these are closely associated with family planning needs. (See Chapter III for further information on family planning).

Summary of Recommendations

Recommendations proposed by the witnesses on October 30th primarily centered around improving cultural awareness on the part of the United States Government and U.S. agencies involved in providing assistance. Beyond that very broad suggestion, there were several other recommendations offered that day.

—Better training of U.S. development assistance personnel. U.S. personnel need to be more aware of the cultural as well as gender differences particular to Africa, and even particular to certain

regions within Africa. Furthermore, men involved in directing, administering, and training need to view women in Development not as a special interest, peripheral program, but as an essential component thoroughly integrated in a development program. One witness noted that agronomists must overcome their misperceptions about talking with women.

--Not only women but also African men need to be educated on family planning issues, and how family size affects women's health, productivity, and family well-being for the future.

--Appropriate technologies are needed, especially for storage, processing and transportation of food; also technology to reduce the burden in finding adequate supplies of fuel and water are needed. Need for training of women to use and maintain the equipment was pointed out, since they do much of these kinds of work.

--Targeting at least 50% of the training in Africa to the women and women's needs was suggested, as were hiring goals to promote women in U.S. development programs and agencies.

--There is a significant need for more extension agents in Africa, particulary with respect to reaching women farmers, teaching new farming techniques, and how to obtain credit and land. More women must be hired as extension agents.

--There is a need for increased research in subsistence farming. Currently there is a gap in research efforts that do not reach the local level or reach women farmers.

--Establishment of women's small rural enterprises was a recommendation offered. The desired result would be increased income-generating projects for women, and for the family.

Ms. Smith listed three recommendations specifically directed toward development institutions:

--Institutions need better evaluation--to look systematically at what has been done in the past, what has worked and what has not worked.

--U.S. AID must be directed to strengthen the currently diminishing capacity of the Women in Development Office and strengthen the role of the Women in Development officers in all African missions to ensure that women are completely involved from the bottom up in the planning and implementation of program work.

--U.S. AID needs to be directed to increase its support for use of private voluntary organizations (PVOs) in long-term PVO development, as PVO's are effective agents that can reach low-income women farmers...The American public has been giving them greater resources, but so should U.S. foreign assistance.